(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
20 February 2003 (20.02.2003)

PCT

(10) International Publication Number
WO 03/013247 A1

(51) International Patent Classification[7]: A01N 43/40, C07D 213/61, 213/64, 213/16, 213/73, 213/57, 213/75, 213/65, 213/74

(21) International Application Number: PCT/EP02/08878

(22) International Filing Date: 8 August 2002 (08.08.2002)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
1471/01 9 August 2001 (09.08.2001) CH

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(81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZM, ZW.

(84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
— *with international search report*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: PYRIDYLPROPYNYLOXYPHENYL DERIVATIVES FOR USE AS HERBICIDES

(57) Abstract: Compounds of formula (I), wherein the substituents R_1, R_2, R_3, R_4 and Z and the suffixes n and m are as defined in claim 1, and the agrochemically acceptable salts and all stereoisomers and tautomers of those compounds are suitable for use as herbicides.

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PYRIDYLPROPYNYLOXYPHENYL DERIVATIVES FOR USE AS HERBICIDES

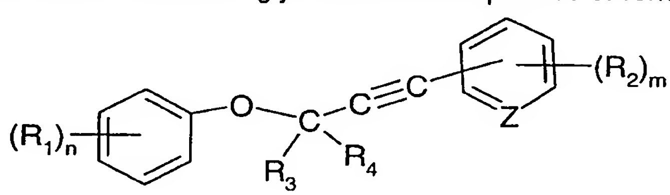
Novel herbicides

The present invention relates to novel herbicidally active pyridyl-alkynes and pyridyl N-oxide-alkynes, to processes for their preparation, to compositions comprising those compounds, and to their use in controlling weeds, especially in crops of useful plants, or in inhibiting plant growth.

Phenylalkynes having herbicidal action are described, for example, in JP-A-11 147 866, WO 01/55066 and PCT Application No. EP01/11353.

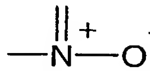
Novel pyridyl-alkynes and pyridyl N-oxide-alkynes having herbicidal and growth-inhibiting properties have now been found.

The present invention accordingly relates to compounds of formula I



(I),

wherein

Z is =N- or  ;

n is 0, 1, 2, 3, 4 or 5;

each R_1 independently of any others is halogen, -CN, -SCN, -SF_5, -NO_2, -NR_5R_6, -CO_2R_7, -$CONR_8R_9$, -$C(R_{10})=NOR_{11}$, -COR_{12}, -OR_{13}, -SR_{14}, -SOR_{15}, -SO_2R_{16}, -OSO_2R_{17}, C_1-C_8alkyl, C_2-C_8alkenyl, C_2-C_8alkynyl or C_3-C_6cycloalkyl; or is C_1-C_8alkyl, C_2-C_8alkenyl or C_2-C_8alkynyl substituted by one or more halogen, -CN, -NO_2, -$NR_{18}R_{19}$, -CO_2R_{20}, -$CONR_{21}R_{22}$, -COR_{23}, -$C(R_{24})=NOR_{25}$, -$C(S)NR_{26}R_{27}$, -C(C_1-C_4alkylthio)=NR_{28}, -OR_{29}, -SR_{30}, -SOR_{31}, -SO_2R_{32} or C_3-C_6cycloalkyl substituents; or

each R_1 independently of any others is C_3-C_6cycloalkyl substituted by one or more halogen, -CN, -NO_2, -$NR_{18}R_{19}$, -CO_2R_{20}, -$CONR_{21}R_{22}$, -COR_{23}, -$C(R_{24})=NOR_{25}$, -$C(S)NR_{26}R_{27}$, -C(C_1-C_4alkylthio)=NR_{28}, -SR_{30}, -SOR_{31}, -SO_2R_{32} or C_3-C_6cycloalkyl substituents; or

each R_1 independently of any others is phenyl, which may in turn be substituted by one or more halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_4alkoxy, -CN, -NO_2, C_1-C_4alkylthio, C_1-C_4alkylsulfinyl or C_1-C_4alkylsulfonyl substituents; or

two adjacent R_1 together form a C_1-C_7alkylene bridge, which may be interrupted by 1 or 2 non-adjacent oxygen atoms and may be substituted by C_1-C_6alkyl or C_1-C_6alkoxy, the total number of ring atoms being at least 5 and at most 9; or

two adjacent R_1 together form a C_2-C_7alkenylene bridge, which may be interrupted by 1 or 2 non-adjacent oxygen atoms and may be substituted by C_1-C_6alkyl or C_1-C_6alkoxy, the total number of ring atoms being at least 5 and at most 9;

R_3 and R_4 are each independently of the other hydrogen, halogen, -CN, C_1-C_4alkyl or C_1-C_4-alkoxy; or

R_3 and R_4 together are C_2-C_5alkylene;

R_5 is hydrogen or C_1-C_8alkyl;

R_6 is hydrogen, C_1-C_8alkyl, C_3-C_8alkenyl, C_3-C_8alkynyl, phenyl or benzyl; wherein phenyl and benzyl may in turn be substituted by one or more halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_4alkoxy, -CN, -NO_2, C_1-C_4alkylthio, C_1-C_4alkylsulfinyl or C_1-C_4alkylsulfonyl substituents; or

R_5 and R_6 together are a C_2-C_5alkylene chain, which may be interrupted by an oxygen or a sulfur atom;

R_7 is hydrogen, C_1-C_8alkyl, C_3-C_8alkenyl or C_3-C_8alkynyl, or is C_1-C_8alkyl, C_3-C_8alkenyl or C_3-C_8alkynyl substituted by one or more halogen, C_1-C_4alkoxy or phenyl substituents, wherein phenyl may in turn be substituted by one or more halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_4alkoxy, -CN, -NO_2, C_1-C_4alkylthio, C_1-C_4alkylsulfinyl or C_1-C_4alkylsulfonyl substituents;

R_8 is hydrogen or C_1-C_8alkyl;

R_9 is hydrogen or C_1-C_8alkyl, or is C_1-C_8alkyl substituted by one or more -COOH, C_1-C_8alkoxycarbonyl or –CN substituents, or

R_9 is C_3-C_8alkenyl, C_3-C_8alkynyl, phenyl or benzyl, wherein phenyl and benzyl may in turn be substituted by one or more halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_4alkoxy, -CN, -NO_2, C_1-C_4alkylthio, C_1-C_4alkylsulfinyl or C_1-C_4alkylsulfonyl substituents; or

R_8 and R_9 together are C_2-C_5alkylene;

R_{10} is hydrogen, C_1-C_4alkyl, C_1-C_4haloalkyl or C_3-C_6cycloalkyl;

R_{11} is hydrogen, C_1-C_8alkyl, C_3-C_8alkenyl, C_3-C_8alkynyl, C_1-C_4haloalkyl or C_3-C_6haloalkenyl;

R_{12} is hydrogen, C_1-C_4alkyl, C_1-C_4haloalkyl or C_3-C_6cycloalkyl;

R_{13} is hydrogen, C_1-C_8alkyl, C_3-C_8alkenyl or C_3-C_8alkynyl; or

R_{13} is phenyl or phenyl-C_1-C_6alkyl, wherein both phenyl rings may in turn be substituted by one or more halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_4alkoxy, -CN, -NO_2, C_1-C_8alkylthio, C_1-C_8alkylsulfinyl or C_1-C_8alkylsulfonyl substituents, or
R_{13} is C_1-C_8alkyl substituted by one or more halogen, –CN, C_1-C_6alkylamino, di(C_1-C_6alkyl)-amino or C_1-C_4alkoxy substituents;
R_{14} is hydrogen, C_1-C_8alkyl, C_3-C_8alkenyl or C_3-C_8alkynyl, or is C_1-C_8alkyl substituted by one or more halogen, –CN or C_1-C_4alkoxy substituents;
R_{15}, R_{16} and R_{17} are each independently of the others C_1-C_8alkyl, C_3-C_8alkenyl or C_3-C_8-alkynyl, or C_1-C_8alkyl substituted by one or more halogen, –CN or C_1-C_4alkoxy substituents;
R_{18} is hydrogen or C_1-C_8alkyl;
R_{19} is hydrogen, C_1-C_8alkyl, C_3-C_8alkenyl, C_3-C_8alkynyl, phenyl or benzyl, wherein phenyl and benzyl may in turn be substituted by one or more halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_4-alkoxy, -CN, -NO_2, C_1-C_4alkylthio, C_1-C_4alkylsulfinyl or C_1-C_4alkylsulfonyl substituents; or
R_{18} and R_{19} together are a C_2-C_5alkylene chain, which may be interrupted by an oxygen or a sulfur atom;
R_{20} is hydrogen, C_1-C_8alkyl, C_3-C_8alkenyl, C_3-C_8alkynyl, phenyl or benzyl, wherein phenyl and benzyl may in turn be substituted by one or more halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_4-alkoxy, -CN, -NO_2, C_1-C_4alkylthio, C_1-C_4alkylsulfinyl or C_1-C_4alkylsulfonyl substituents;
R_{21} is hydrogen or C_1-C_8alkyl;
R_{22} is hydrogen or C_1-C_8alkyl, or is C_1-C_8alkyl substituted by one or more -COOH, C_1-C_8-alkoxycarbonyl or –CN substituents, or
R_{22} is C_3-C_8alkenyl, C_3-C_8alkynyl, phenyl or benzyl, wherein phenyl and benzyl may in turn be substituted by one or more halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_4alkoxy, -CN, -NO_2, C_1-C_4alkylthio, C_1-C_4alkylsulfinyl or C_1-C_4alkylsulfonyl substituents; or
R_{21} and R_{22} together are C_2-C_5alkylene;
R_{23} is hydrogen, C_1-C_4alkyl, C_1-C_4haloalkyl or C_3-C_6cycloalkyl;
R_{24} is hydrogen, C_1-C_4alkyl, C_1-C_4haloalkyl or C_3-C_6cycloalkyl;
R_{25} is hydrogen, C_1-C_8alkyl, C_3-C_8alkenyl, C_3-C_8alkynyl, C_1-C_4haloalkyl or C_3-C_6haloalkenyl;
R_{26} is hydrogen or C_1-C_8alkyl;
R_{27} is hydrogen or C_1-C_8alkyl, or is C_1-C_8alkyl substituted by one or more -COOH, C_1-C_8-alkoxycarbonyl or –CN substituents, or
R_{27} is C_3-C_8alkenyl, C_3-C_8alkynyl, phenyl or benzyl, wherein phenyl and benzyl may in turn be substituted by one or more halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_4alkoxy, -CN, -NO_2, C_1-C_4alkylthio, C_1-C_4alkylsulfinyl or C_1-C_4alkylsulfonyl substituents; or
R_{26} and R_{27} together are C_2-C_5alkylene;
R_{28} is hydrogen or C_1-C_8alkyl;

R_{29} and R_{30} are each independently of the other hydrogen, C_1-C_8alkyl, C_3-C_8alkenyl or C_3-C_8alkynyl, or C_1-C_8alkyl substituted by one or more halogen, –CN or C_1-C_4alkoxy substituents;
R_{31} and R_{32} are each independently of the other C_1-C_8alkyl, C_3-C_8alkenyl or C_3-C_8alkynyl, or C_1-C_8alkyl substituted by one or more halogen, –CN or C_1-C_4alkoxy substituents;
m is 0, 1, 2, 3 or 4;
each R_2 independently of any others is halogen, -CN, -SCN, -OCN, $-N_3$, $-SF_5$, $-NO_2$, $-NR_{33}R_{34}$, $-CO_2R_{35}$, $-CONR_{36}R_{37}$, $-C(R_{38})$=NOR_{39}, $-COR_{40}$, $-OR_{41}$, $-SR_{42}$, $-SOR_{43}$, $-SO_2R_{44}$, $-OSO_2R_{45}$, $-N([CO]_pR_{46})COR_{47}$, $-N(OR_{54})COR_{55}$, $-N(R_{56})SO_2R_{57}$, $-N(SO_2R_{58})SO_2R_{59}$, $-N$=$C(OR_{60})R_{61}$, $-CR_{62}(OR_{63})OR_{64}$, $-OC(O)NR_{65}R_{66}$, $-SC(O)NR_{67}R_{68}$, $-OC(S)NR_{69}R_{70}$ or -N-phthalimide; or
R_2 is a 5- to 7-membered heterocyclic ring system which may be aromatic or partially or fully saturated and may contain from 1 to 4 hetero atoms selected from nitrogen, oxygen and sulfur, it being possible for that heterocyclic ring system in turn to be substituted by one or more halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, hydroxy-C_1-C_4alkyl, C_1-C_4alkoxy, C_1-C_4alkoxy-C_1-C_4alkyl, -CN, $-NO_2$, C_1-C_6alkylthio, C_1-C_6alkylsulfinyl or C_1-C_6alkylsulfonyl substituents;
R_{33} is hydrogen or C_1-C_8alkyl; and
R_{34} is hydrogen, C_1-C_8alkyl, C_3-C_8alkenyl, C_3-C_8alkynyl, phenyl or benzyl, wherein phenyl and benzyl may in turn be substituted by one or more halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_4-alkoxy, -CN, $-NO_2$, C_1-C_4alkylthio, C_1-C_4alkylsulfinyl or C_1-C_4alkylsulfonyl substituents; or
R_{33} and R_{34} together are a C_2-C_5alkylene chain, which may be interrupted by an oxygen or a sulfur atom;
R_{35} is hydrogen, C_1-C_8alkyl, C_3-C_8alkenyl or C_3-C_8alkynyl, or is C_1-C_8alkyl, C_3-C_8alkenyl or C_3-C_8alkynyl substituted by one or more halogen, C_1-C_4alkoxy or phenyl substituents, wherein phenyl may in turn be substituted by one or more halogen, C_1-C_4alkyl, C_1-C_4halo-alkyl, C_1-C_4alkoxy, -CN, $-NO_2$, C_1-C_4alkylthio, C_1-C_4alkylsulfinyl or C_1-C_4alkylsulfonyl substituents;
R_{36} is hydrogen or C_1-C_8alkyl;
R_{37} is hydrogen or C_1-C_8alkyl, or is C_1-C_8alkyl substituted by one or more -COOH, C_1-C_8-alkoxycarbonyl or –CN substituents, or
R_{37} is C_3-C_8alkenyl, C_3-C_8alkynyl, phenyl or benzyl, wherein phenyl and benzyl may in turn be substituted by one or more halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_4alkoxy, -CN, $-NO_2$, C_1-C_4alkylthio, C_1-C_4alkylsulfinyl or C_1-C_4alkylsulfonyl substituents; or
R_{36} and R_{37} together are C_3-C_5alkylene;
R_{38} is hydrogen, C_1-C_4alkyl, C_1-C_4haloalkyl or C_3-C_6cycloalkyl;
R_{39} is hydrogen, C_1-C_8alkyl, C_3-C_8alkenyl, C_3-C_8alkynyl, C_1-C_4haloalkyl or C_3-C_6haloalkenyl;

R_{40} is hydrogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_8alkylthio, -C(O)-C(O)OC_1-C_4alkyl or C_3-C_6-cycloalkyl;

R_{41} is hydrogen, C_1-C_8alkyl, C_3-C_8alkenyl, C_3-C_8alkynyl, C_1-C_6alkoxy-C_1-C_6alkyl, C_1-C_8alkyl-carbonyl, C_1-C_8alkoxycarbonyl, C_3-C_8alkenyloxycarbonyl, C_1-C_6alkoxy-C_1-C_6alkoxycarbonyl, C_1-C_6alkylthio-C_1-C_6alkyl, C_1-C_6alkylsulfinyl-C_1-C_6alkyl or C_1-C_6alkylsulfonyl-C_1-C_6alkyl; or

R_{41} is phenyl or phenyl-C_1-C_6alkyl, wherein both phenyl rings may in turn be substituted by one or more halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_4alkoxy, -CN, -NO_2, or -$S(O)_2C_1$-C_8alkyl substituents, or

R_{41} is C_1-C_8alkyl substituted by one or more –COOH, C_1-C_8alkoxycarbonyl, C_1-C_6alkylamino, di(C_1-C_6alkyl)amino or –CN substituents;

R_{42} is hydrogen, C_1-C_8alkyl, C_3-C_8alkenyl or C_3-C_8alkynyl, or is C_1-C_8alkyl substituted by one or more halogen, –CN or C_1-C_4alkoxy substituents;

R_{43} and R_{44} are each independently of the other C_1-C_8alkyl, C_3-C_8alkenyl or C_3-C_8alkynyl, or C_1-C_8alkyl substituted by one or more halogen, –CN or C_1-C_4alkoxy substituents;

R_{45} is C_1-C_8alkyl, C_1-C_8alkyl substituted by one or more halogen, -CN or C_1-C_4alkoxy substituents, C_3-C_8alkenyl or C_3-C_8alkynyl, or

R_{45} is phenyl, it being possible for the phenyl ring to be substituted by one or more halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_4alkoxy, -CN, -NO_2, C_1-C_8alkylthio, C_1-C_8alkylsulfinyl or C_1-C_8alkylsulfonyl substituents;

R_{46} is hydrogen, C_1-C_8alkyl, C_3-C_8alkenyl, C_3-C_8alkynyl or C_1-C_4haloalkyl;

R_{47} is hydrogen, C_1-C_8alkyl, C_1-C_4alkoxy, C_3-C_8alkenyl or C_3-C_8alkynyl, or is C_1-C_8alkyl substituted by one or more halogen, -CN, C_1-C_4alkoxy, C_1-C_8alkoxycarbonyl, -NH_2, C_1-C_4-alkylamino, di(C_1-C_4-alkyl)amino, -$NR_{48}COR_{49}$, -$NR_{50}SO_2R_{51}$ or -$NR_{52}CO_2R_{53}$ substituents, or

R_{47} is phenyl or benzyl, each of which may in turn be substituted by one or more halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_4alkoxy, -CN, -NO_2, C_1-C_4alkylthio, C_1-C_4alkylsulfinyl or C_1-C_4alkylsulfonyl substituents;

p is 0 or 1;

R_{48}, R_{49}, R_{50}, R_{51}, R_{52} and R_{53} are each independently of the others hydrogen, C_1-C_8alkyl, phenyl, benzyl or naphthyl, it being possible for the three last-mentioned aromatic radicals in turn to be substituted by one or more halogen, C_1-C_8alkyl, C_1-C_4haloalkyl, C_1-C_4alkoxy, C_1-C_4alkylamino, di(C_1-C_4alkyl)amino, -NH_2, -CN, -NO_2, C_1-C_4alkylthio, C_1-C_4alkylsulfinyl or C_1-C_4alkylsulfonyl substituents;

R_{54} and R_{55} are each independently of the other hydrogen, C_1-C_6alkyl or phenyl, whereby the phenyl ring may in turn be substituted by one or more halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_4alkoxy, -CN, -NO_2, C_1-C_8alkylthio, C_1-C_8alkylsulfinyl or C_1-C_8alkylsulfonyl substituents;

R_{56} is hydrogen, C_1-C_8alkyl, C_1-C_4haloalkyl, C_1-C_4alkoxy, C_3-C_8alkenyl, C_3-C_8alkynyl or benzyl, it being possible for benzyl in turn to be substituted by one or more halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_4alkoxy, -CN, -NO_2, C_1-C_8alkylthio, C_1-C_8alkylsulfinyl or C_1-C_8alkylsulfonyl substituents;

R_{57} is C_1-C_8alkyl, C_1-C_4haloalkyl, phenyl, benzyl or naphthyl, it being possible for the three last-mentioned aromatic rings to be substituted by one or more halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_4alkoxy, C_1-C_4alkylamino, di(C_1-C_4alkyl)amino, -NH_2, -CN, -NO_2, C_1-C_4alkylthio, C_1-C_4alkylsulfinyl or C_1-C_4alkylsulfonyl substituents;

R_{58} and R_{59} are each independently of the other C_1-C_8alkyl, C_3-C_8alkenyl, C_3-C_8alkynyl, phenyl, benzyl or naphthyl, it being possible for the three last-mentioned aromatic rings to be substituted by one or more halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_4alkoxy, C_1-C_4alkyl-amino, di(C_1-C_4alkyl)amino, -NH_2, -CN, -NO_2, C_1-C_4alkylthio, C_1-C_4alkylsulfinyl or C_1-C_4alkyl-sulfonyl substituents;

R_{60} and R_{61} are each independently of the other hydrogen or C_1-C_6alkyl;

R_{62}, R_{63} and R_{64} are each independently of the others hydrogen or C_1-C_8alkyl, or

R_{63} and R_{64} together form a C_2-C_5alkylene bridge;

R_{65}, R_{66}, R_{67}, R_{68}, R_{69} and R_{70} are each independently of the others hydrogen or C_1-C_8alkyl, or

R_{65} and R_{66} together or R_{67} and R_{68} together or R_{69} and R_{70} together form a C_2-C_5alkylene bridge; or

each R_2 independently of any others is C_1-C_8alkyl, or is C_1-C_8alkyl mono- or poly-substituted by halogen, -CN, -N_3, -SCN, -NO_2, -$NR_{71}R_{72}$, -CO_2R_{73}, -$CONR_{74}R_{75}$, -COR_{76}, -C(R_{77})=NOR_{78}, -C(S)$NR_{79}R_{80}$, -C(C_1-C_4alkylthio)=NR_{81}, -OR_{82}, -SR_{83}, -SOR_{84}, -SO_2R_{85}, -O(SO_2)R_{86}, -N(R_{87})CO_2R_{88}, -N(R_{89})COR_{90}, -$S^+(R_{91})_2$, -$N^+(R_{92})_3$, -$Si(R_{93})_3$ or C_3-C_6cycloalkyl; or

each R_2 independently of any others is C_1-C_8alkyl substituted by a 5- to 7-membered heterocyclic ring system, which may be aromatic or partially or fully saturated and may contain from 1 to 4 hetero atoms selected from nitrogen, oxygen and sulfur, it being possible for that heterocyclic ring system in turn to be substituted by one or more halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, hydroxy-C_1-C_4alkyl, C_1-C_4alkoxy, C_1-C_4alkoxy-C_1-C_4alkyl, -CN, -NO_2, C_1-C_6alkylthio, C_1-C_6alkylsulfinyl or C_1-C_6alkylsulfonyl substituents; or

each R_2 independently of any others is C_2-C_8alkenyl, or is C_2-C_8alkenyl mono- or poly-substituted by halogen, -CN, -NO_2, -CO_2R_{94}, -$CONR_{95}R_{96}$, -COR_{97}, -C(R_{98})=NOR_{99}, -C(S)$NR_{100}R_{101}$, -C(C_1-C_4alkylthio)=NR_{102}, -OR_{103}, -$Si(R_{104})_3$ or C_3-C_6cycloalkyl; or

each R_2 independently of any others is C_2-C_8alkynyl, or is C_2-C_8alkynyl mono- or poly-substituted by halogen, -CN, -CO_2R_{105}, -$CONR_{106}R_{107}$, -COR_{108}, -C(R_{109})=NOR_{110}, -C(S)$NR_{111}R_{112}$, -C(C_1-C_4alkylthio)=NR_{113}, -OR_{114}, -$Si(R_{115})_3$ or C_3-C_6cycloalkyl; or

each R_2 independently of any others is C_3-C_6cycloalkyl, or is C_3-C_6cycloalkyl mono- or poly-substituted by halogen, -CN, $-CO_2R_{116}$, $-CONR_{117}R_{118}$, $-COR_{119}$, $-C(R_{120})=NOR_{121}$, $-C(S)NR_{122}R_{123}$ or $-C(C_1$-C_4alkylthio)$=NR_{124}$; or

two adjacent R_2 together form a C_1-C_7alkylene bridge, which may be interrupted by 1 or 2 non-adjacent oxygen atoms and may be substituted by C_1-C_6alkyl or C_1-C_6alkoxy, the total number of ring atoms being at least 5 and at most 9; or

two adjacent R_2 together form a C_2-C_7alkenylene bridge, which may be interrupted by 1 or 2 non-adjacent oxygen atoms and may be substituted by C_1-C_6alkyl or C_1-C_6alkoxy, the total number of ring atoms being at least 5 and at most 9;

R_{71} is hydrogen or C_1-C_8alkyl;

R_{72} is hydrogen, C_1-C_8alkyl, C_3-C_8alkenyl, C_3-C_8alkynyl, phenyl or benzyl, wherein phenyl and benzyl may in turn be substituted by one or more halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_4alkoxy, -CN, $-NO_2$, C_1-C_4alkylthio, C_1-C_4alkylsulfinyl or C_1-C_4alkylsulfonyl substituents; or

R_{71} and R_{72} together are a C_2-C_5alkylene chain, which may be interrupted by an oxygen or a sulfur atom;

R_{73} is hydrogen, C_1-C_8alkyl, C_3-C_8alkenyl or C_3-C_8alkynyl, or is C_1-C_8alkyl, C_3-C_8alkenyl or C_3-C_8alkynyl substituted by one or more halogen, C_1-C_4alkoxy or phenyl substituents, it being possible for phenyl in turn to be substituted by one or more halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_4alkoxy, -CN, $-NO_2$, C_1-C_4alkylthio, C_1-C_4alkylsulfinyl or C_1-C_4alkyl-sulfonyl substituents;

R_{74} is hydrogen or C_1-C_8alkyl;

R_{75} is hydrogen, C_1-C_8alkyl or C_3-C_7cycloalkyl, or is C_1-C_8alkyl substituted by one or more -COOH, C_1-C_8alkoxycarbonyl, C_1-C_6alkoxy or –CN substituents; or

R_{75} is C_3-C_8alkenyl, C_3-C_8alkynyl, phenyl or benzyl, wherein phenyl and benzyl may in turn be substituted by one or more halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_4alkoxy, -CN, $-NO_2$, C_1-C_4alkylthio, C_1-C_4alkylsulfinyl or C_1-C_4alkylsulfonyl substituents; or

R_{74} and R_{75} together are a C_2-C_5alkylene chain, which may be interrupted by an oxygen or sulfur atom;

R_{76} is hydrogen, C_1-C_4alkyl, C_1-C_4haloalkyl or C_3-C_6cycloalkyl;

R_{77} is hydrogen, C_1-C_4alkyl, C_1-C_4haloalkyl or C_3-C_6cycloalkyl;

R_{78} is hydrogen, C_1-C_8alkyl, C_3-C_8alkenyl, C_3-C_8alkynyl, C_1-C_4haloalkyl or C_3-C_6haloalkenyl; and

R_{79} is hydrogen or C_1-C_8alkyl;

R_{80} is hydrogen or C_1-C_8alkyl, or is C_1-C_8alkyl substituted by one or more -COOH, C_1-C_8-alkoxycarbonyl or –CN substituents; or

R_{80} is C_3-C_8alkenyl, C_3-C_8alkynyl, phenyl or benzyl, wherein phenyl and benzyl may in turn be substituted by one or more halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_4alkoxy, -CN, -NO_2, C_1-C_4alkylthio, C_1-C_4alkylsulfinyl or C_1-C_4alkylsulfonyl substituents; or

R_{79} and R_{80} together are C_2-C_5alkylene;

R_{81} is hydrogen or C_1-C_8alkyl;

R_{82} is -Si(C_1-C_6alkyl)$_3$, C_3-C_8alkenyl, C_3-C_8alkynyl or C_1-C_8alkyl, whereby C_1-C_8alkyl is mono- or poly-substituted by halogen, -CN, -NH_2, C_1-C_6alkylamino, di(C_1-C_6alkyl)amino or C_1-C_4alkoxy;

R_{83} is hydrogen, C_1-C_8alkyl, C_3-C_8alkenyl, C_3-C_8alkynyl or C_1-C_8alkyl, whereby C_1-C_8alkyl is mono- or poly-substituted by halogen, -CN, -NH_2, C_1-C_6alkylamino, di(C_1-C_6alkyl)amino or C_1-C_4alkoxy;

R_{84}, R_{85} and R_{86} are each independently of the others C_1-C_8alkyl, C_3-C_8alkenyl or C_3-C_8-alkynyl, or C_1-C_8alkyl which is substituted by one or more halogen, –CN or C_1-C_4alkoxy substituents;

R_{87} and R_{89} are each independently of the other hydrogen, C_1-C_8alkyl or C_1-C_8alkoxy;

R_{88} is C_1-C_8alkyl;

R_{90} is hydrogen or C_1-C_8alkyl;

R_{91} is C_1-C_4alkyl;

R_{92} and R_{93} are each independently of the other C_1-C_6alkyl;

R_{94} is hydrogen, C_1-C_8alkyl, C_3-C_8alkenyl or C_3-C_8alkynyl, each of which may be mono- or poly-substituted by one or more halogen, C_1-C_4alkoxy or phenyl substituents, wherein phenyl may in turn be substituted by one or more halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_4alkoxy, -CN, -NO_2, C_1-C_4alkylthio, C_1-C_4alkylsulfinyl or C_1-C_4alkylsulfonyl substituents;

R_{95} is hydrogen or C_1-C_8alkyl;

R_{96} is hydrogen or C_1-C_8alkyl, or is C_1-C_8alkyl substituted by one or more -COOH, C_1-C_8-alkoxycarbonyl or –CN substituents; or

R_{96} is C_3-C_8alkenyl, C_3-C_8alkynyl, phenyl or benzyl, wherein phenyl and benzyl may in turn be substituted by one or more halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_4alkoxy, -CN, -NO_2, C_1-C_4alkylthio, C_1-C_4alkylsulfinyl or C_1-C_4alkylsulfonyl substituents; or

R_{95} and R_{96} together are C_2-C_5alkylene;

R_{97} and R_{98} are each independently of the other hydrogen, C_1-C_4alkyl, C_1-C_4haloalkyl or C_3-C_6cycloalkyl;

R_{99} is hydrogen, C_1-C_8alkyl, C_3-C_8alkenyl, C_3-C_8alkynyl, C_1-C_4haloalkyl or C_3-C_6haloalkenyl;

R_{100} is hydrogen or C_1-C_8alkyl;

R_{101} is hydrogen or C_1-C_8alkyl, or is C_1-C_8alkyl substituted by one or more -COOH, C_1-C_8-alkoxycarbonyl or –CN substituents; or

R_{101} is C_3-C_8alkenyl, C_3-C_8alkynyl, phenyl or benzyl, wherein phenyl and benzyl may in turn be substituted by one or more halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_4alkoxy, -CN, -NO_2, C_1-C_4alkylthio, C_1-C_4alkylsulfinyl or C_1-C_4alkylsulfonyl substituents; or

R_{100} and R_{101} together are C_2-C_5alkylene;

R_{102} is hydrogen or C_1-C_8alkyl;

R_{103} is hydrogen, C_1-C_8alkyl, -Si(C_1-C_6alkyl)$_3$, C_3-C_8alkenyl or C_3-C_8alkynyl;

R_{104} is C_1-C_6alkyl;

R_{105} is hydrogen, C_1-C_8alkyl, C_3-C_8alkenyl or C_3-C_8alkynyl, each of which may be mono- or poly-substituted by one or more halogen, C_1-C_4alkoxy or phenyl substituents, wherein phenyl may in turn be substituted by one or more halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_4alkoxy, -CN, -NO_2, C_1-C_4alkylthio, C_1-C_4alkylsulfinyl or C_1-C_4alkylsulfonyl substituents;

R_{106} is hydrogen or C_1-C_8alkyl;

R_{107} is hydrogen or C_1-C_8alkyl, or is C_1-C_8alkyl substituted by one or more -COOH, C_1-C_8-alkoxycarbonyl or –CN substituents; or

R_{107} is C_3-C_8alkenyl, C_3-C_8alkynyl, phenyl or benzyl, wherein phenyl and benzyl may in turn be substituted by one or more halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_4alkoxy, -CN, -NO_2, C_1-C_4alkylthio, C_1-C_4alkylsulfinyl or C_1-C_4alkylsulfonyl substituents; or

R_{106} and R_{107} together are C_2-C_5alkylene;

R_{108} is hydrogen, C_1-C_4alkyl, C_1-C_4haloalkyl or C_3-C_6cycloalkyl;

R_{109} is hydrogen, C_1-C_4alkyl, C_1-C_4haloalkyl or C_3-C_6cycloalkyl;

R_{110} is hydrogen, C_1-C_8alkyl, C_3-C_8alkenyl, C_3-C_8alkynyl, C_1-C_4haloalkyl or C_3-C_6haloalkenyl;

R_{111} is hydrogen or C_1-C_8alkyl;

R_{112} is hydrogen or C_1-C_8alkyl, or is C_1-C_8alkyl substituted by one or more -COOH, C_1-C_8-alkoxycarbonyl or –CN substituents; or

R_{112} is C_3-C_8alkenyl, C_3-C_8alkynyl, phenyl or benzyl, wherein phenyl and benzyl may in turn be substituted by one or more halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_4alkoxy, -CN, -NO_2, C_1-C_4alkylthio, C_1-C_4alkylsulfinyl or C_1-C_4alkylsulfonyl substituents; or

R_{111} and R_{112} together are C_2-C_5alkylene;

R_{113} is hydrogen or C_1-C_8alkyl;

R_{114} is hydrogen, C_1-C_8alkyl, -Si(C_1-C_6alkyl)$_3$, C_3-C_8alkenyl or C_3-C_8alkynyl;

R_{115} is C_1-C_6alkyl;

R_{116} is hydrogen, C_1-C_8alkyl, C_3-C_8alkenyl or C_3-C_8alkynyl, each of which may be mono- or poly-substituted by one or more halogen, C_1-C_4alkoxy or phenyl substituents, wherein phenyl may in turn be substituted by one or more halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_4alkoxy, -CN, -NO_2, C_1-C_4alkylthio, C_1-C_4alkylsulfinyl or C_1-C_4alkylsulfonyl substituents;

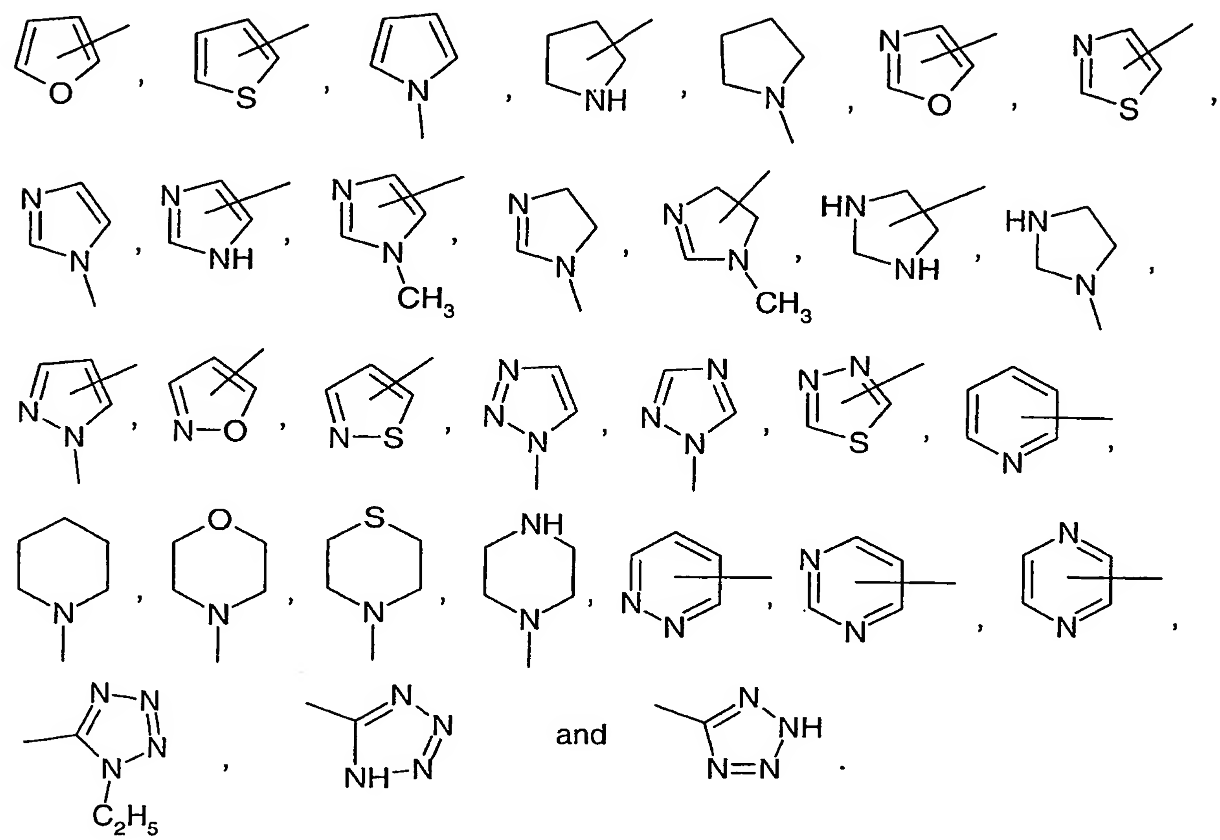
R_{117} is hydrogen or C_1-C_8alkyl;

R_{118} is hydrogen or C_1-C_8alkyl, or is C_1-C_8alkyl substituted by one or more -COOH, C_1-C_8alkoxycarbonyl or –CN substituents; or
R_{118} is C_3-C_8alkenyl, C_3-C_8alkynyl, phenyl or benzyl, wherein phenyl and benzyl may in turn be substituted by one or more halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_4alkoxy, -CN, -NO_2, C_1-C_4alkylthio, C_1-C_4alkylsulfinyl or C_1-C_4alkylsulfonyl substituents; or
R_{117} and R_{118} together are C_2-C_5alkylene;
R_{119} is hydrogen, C_1-C_4alkyl, C_1-C_4haloalkyl or C_3-C_6cycloalkyl;
R_{120} is hydrogen, C_1-C_4alkyl, C_1-C_4haloalkyl or C_3-C_6cycloalkyl;
R_{121} is hydrogen, C_1-C_8alkyl, C_3-C_8alkenyl, C_3-C_8alkynyl, C_1-C_4haloalkyl or C_3-C_6haloalkenyl;
R_{122} is hydrogen or C_1-C_8alkyl;
R_{123} is hydrogen or C_1-C_8alkyl, or is C_1-C_8alkyl substituted by one or more -COOH, C_1-C_8-alkoxycarbonyl or –CN substituents; or
R_{123} is C_3-C_8alkenyl, C_3-C_8alkynyl, phenyl or benzyl, wherein phenyl and benzyl may in turn be substituted by one or more halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_4alkoxy, -CN, -NO_2, C_1-C_4alkylthio, C_1-C_4alkylsulfinyl or C_1-C_4alkylsulfonyl substituents; or
R_{122} and R_{123} together are C_2-C_5alkylene; and
R_{124} is hydrogen or C_1-C_8alkyl,
and to the agrochemically acceptable salts and all stereoisomers and tautomers of the compounds of formula I.

When n is 0, all the free valencies on the phenyl ring of the compounds of formula I are substituted by hydrogen. When m is 0, all the free valencies on the pyridyl ring of the compounds of formula I are substituted by hydrogen.

Examples of substituents that are formed when R_5 and R_6 together or R_{18} and R_{19} together or R_{36} and R_{37} together or R_{74} and R_{75} together are a C_2-C_5alkylene chain, which may be interrupted by an oxygen or a sulfur atom, are piperidine, morpholine, thiomorpholine and pyrrolidine.

Examples of heterocyclic ring systems, which may be aromatic or partially or fully saturated, in the definition of R_2 are:



The alkyl groups appearing in the definitions of substituents may be straight-chain or branched and are, for example, methyl, ethyl, n-propyl, isopropyl, n-butyl, sec-butyl, isobutyl, tert-butyl, and also the isomers of pentyl, hexyl, heptyl, octyl, nonyl and decyl.

Halogen is fluorine, chlorine, bromine and iodine, preferably fluorine and chlorine. Haloalkyl is, for example, fluoromethyl, difluoromethyl, trifluoromethyl, chloromethyl, dichloromethyl, trichloromethyl, 2,2,2-trifluoroethyl, 2-fluoroethyl, 2-chloroethyl, pentafluoroethyl, 1,1-difluoro-2,2,2-trichloroethyl, 2,2,3,3-tetrafluoroethyl and 2,2,2-trichloroethyl; preferably trichloromethyl, difluorochloromethyl, difluoromethyl, trifluoromethyl and dichlorofluoromethyl.

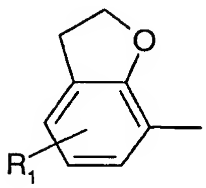
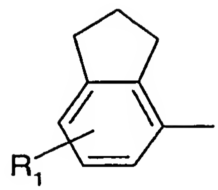
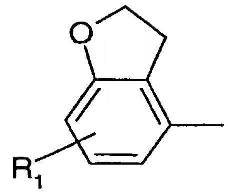
Alkoxy groups have preferably a chain length of from 1 to 6, especially from 1 to 4, carbon atoms. Alkoxy is, for example, methoxy, ethoxy, propoxy, isopropoxy, n-butoxy, isobutoxy, sec-butoxy and tert-butoxy, and also the pentyloxy and hexyloxy isomers; preferably methoxy and ethoxy.

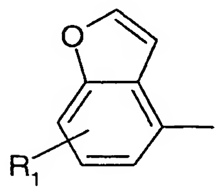
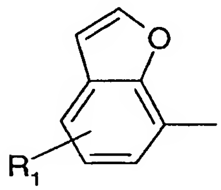
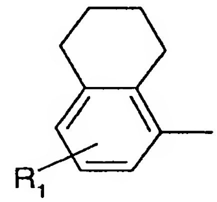
Alkoxy, alkenyl, alkynyl, alkoxyalkyl, alkylthio, alkylsulfonyl, alkylsulfinyl, alkylaminoalkoxy, alkoxycarbonyl, alkylcarbonyloxy, alkenylthio, alkenylsulfonyl, alkenylsulfinyl, alkynylsulfonyl, alkynylthio and alkynylsulfinyl groups are derived from the mentioned alkyl radicals. The alkenyl and alkynyl groups can be mono- or poly-unsaturated. Alkenyl is to be understood as being, for example, vinyl, allyl, methallyl, 1-methylvinyl or but-2-en-1-yl. Alkynyl is, for example, ethynyl, propargyl, but-2-yn-1-yl, 2-methylbutyn-2-yl or but-3-yn-2-yl.

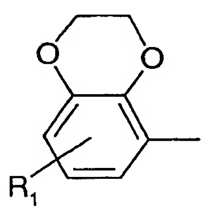
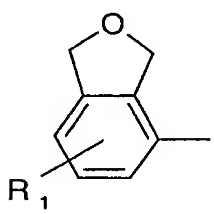
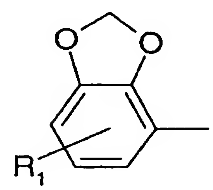
Alkylthio groups have preferably a chain length of from 1 to 4 carbon atoms. Alkylthio is, for example, methylthio, ethylthio, propylthio, isopropylthio, n-butylthio, isobutylthio, sec-butylthio or tert-butylthio, preferably methylthio and ethylthio. Alkylsulfinyl is, for example, methylsulfinyl, ethylsulfinyl, propylsulfinyl, isopropylsulfinyl, n-butylsulfinyl, isobutylsulfinyl, sec-butylsulfinyl or tert-butylsulfinyl; preferably methylsulfinyl or ethylsulfinyl.
Alkylsulfonyl is, for example, methylsulfonyl, ethylsulfonyl, propylsulfonyl, isopropylsulfonyl, n-butylsulfonyl, isobutylsulfonyl, sec-butylsulfonyl or tert-butylsulfonyl; preferably methylsulfonyl or ethylsulfonyl.

Alkoxyalkyl groups have preferably from 1 to 6 carbon atoms. Alkoxyalkyl is, for example, methoxymethyl, methoxyethyl, ethoxymethyl, ethoxyethyl, n-propoxymethyl, n-propoxyethyl, isopropoxymethyl or isopropoxyethyl.

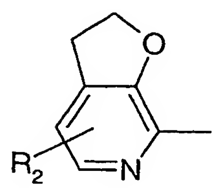
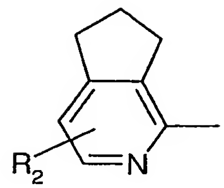
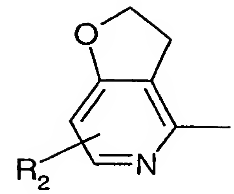
Substituents wherein two adjacent R_1 together form a C_1-C_7alkylene bridge which may be interrupted by 1 or 2 non-adjacent oxygen atoms and may be substituted by C_1-C_6alkyl or C_1-C_6alkoxy, the total number of ring atoms being at least 5 and at most 9, or two adjacent R_1 together form a C_2-C_7alkenylene bridge which may be interrupted by 1 or 2 non-adjacent oxygen atoms and may be substituted by C_1-C_6alkyl or C_1-C_6alkoxy, the total number of ring atoms being at least 5 and at most 9, have, for example, the following structures:

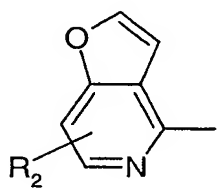
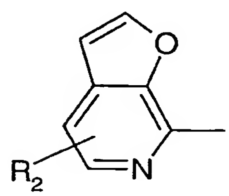
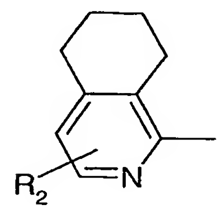
 ,  ,  ,

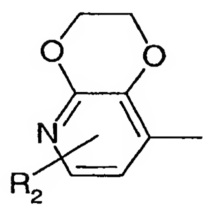
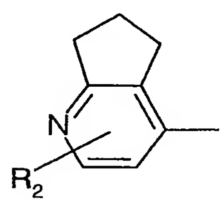
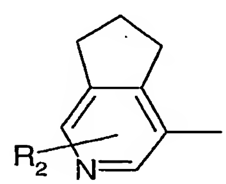
 ,  ,  ,

 ,  and  .

Substituents wherein two adjacent R_2 together form a C_1-C_7alkylene bridge which may be interrupted by 1 or 2 non-adjacent oxygen atoms and may be substituted by C_1-C_6alkyl or C_1-C_6alkoxy, the total number of ring atoms being at least 5 and at most 9, or two adjacent R_2 together form a C_2-C_7alkenylene bridge which may be interrupted by 1 or 2 non-adjacent oxygen atoms and may be substituted by C_1-C_6alkyl or C_1-C_6alkoxy, the total number of ring atoms being at least 5 and at most 9, have, for example, the following structures:

 ,  ,  ,

 ,  ,  ,

 ,  and  .

The invention relates also to the salts which the compounds of formula I are able to form especially with amines, alkali metal and alkaline earth metal bases or quaternary ammonium bases. Suitable salt-formers are described, for example, in WO 98/41089.

Among the alkali metal and alkaline earth metal hydroxides as salt formers, special mention should be made of the hydroxides of lithium, sodium, potassium, magnesium and calcium, but especially the hydroxides of sodium and potassium.

Examples of amines suitable for ammonium salt formation include ammonia as well as primary, secondary and tertiary C_1-C_{18}alkylamines, C_1-C_4hydroxyalkylamines and C_2-C_4-alkoxyalkylamines, for example methylamine, ethylamine, n-propylamine, isopropylamine, the four butylamine isomers, n-amylamine, isoamylamine, hexylamine, heptylamine, octylamine, nonylamine, decylamine, pentadecylamine, hexadecylamine, heptadecylamine, octadecylamine, methylethylamine, methylisopropylamine, methylhexylamine, methylnonylamine, methylpentadecylamine, methyloctadecylamine, ethylbutylamine, ethylheptylamine, ethyloctylamine, hexylheptylamine, hexyloctylamine, dimethylamine, diethylamine, di-n-propylamine, diisopropylamine, di-n-butylamine, di-n-amylamine, diisoamylamine, dihexylamine, diheptylamine, dioctylamine, ethanolamine, n-propanolamine, isopropanolamine, N,N-

diethanolamine, N-ethylpropanolamine, N-butylethanolamine, allylamine, n-butenyl-2-amine, n-pentenyl-2-amine, 2,3-dimethylbutenyl-2-amine, dibutenyl-2-amine, n-hexenyl-2-amine, propylenediamine, trimethylamine, triethylamine, tri-n-propylamine, triisopropylamine, tri-n-butylamine, triisobutylamine, tri-sec-butylamine, tri-n-amylamine, methoxyethylamine and ethoxyethylamine; heterocyclic amines, for example pyridine, quinoline, isoquinoline, morpholine, piperidine, pyrrolidine, indoline, quinuclidine and azepine; primary arylamines, for example anilines, methoxyanilines, ethoxyanilines, o-, m- and p-toluidines, phenylenediamines, benzidines, naphthylamines and o-, m- and p-chloroanilines; but especially triethylamine, isopropylamine and diisopropylamine.

Preferred quaternary ammonium bases suitable for salt formation correspond e.g. to the formula $[N(R_a R_b R_c R_d)]OH$ wherein R_a, R_b, R_c and R_d are each independently of the other C_1-C_4alkyl. Other suitable tetraalkylammonium bases with other anions can be obtained, for example, by anion exchange reactions.

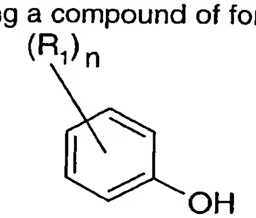
Preferred compounds of formula I are those wherein Z is =N-; and each R_2 independently of any others is C_2-C_8alkenyl, or is C_2-C_8alkenyl mono- or poly-substituted by -CN, $-NO_2$, $-CO_2R_{94}$, $-CONR_{95}R_{96}$, $-COR_{97}$, $-C(R_{98})$=NOR_{99}, $-C(S)NR_{100}R_{101}$, -C(C_1-C_4alkylthio)=NR_{102}, $-OR_{103}$, $-Si(R_{104})_3$ or C_3-C_6cycloalkyl.

Further preferred compounds of formula I are those wherein each R_2 independently of any others is halogen, -CN, -SCN, -OCN, $-N_3$, $-CONR_{36}R_{37}$, $-C(R_{38})$=NOR_{39}, $-COR_{40}$, $-OR_{41}$, $-SO_2R_{45}$, $-N([CO]_pR_{46})COR_{47}$, $-N(R_{56})SO_2R_{57}$, $-N(SO_2R_{58})SO_2R_{59}$, $-N$=$C(OR_{60})R_{61}$ or C_1-C_8alkyl, or is C_1-C_8alkyl mono- or poly-substituted by halogen, -CN, $-N_3$, -SCN, $-CONR_{74}R_{75}$, $-COR_{76}$, $-C(R_{77})$=NOR_{78}, $-C(S)NR_{79}R_{80}$, $-OR_{82}$, $-SOR_{84}$, $-SO_2R_{85}$ or $-N(R_{89})COR_{90}$.

Preference is likewise given to compounds of formula I wherein each R_1 independently of any others is halogen, -CN, C_1-C_3alkyl, C_1-C_3haloalkyl, C_1-C_3cyanoalkyl, $-OR_{13}$ or $-C(R_{24})$=NOR_{25}; R_{13} is C_1-C_3alkyl or di(C_1-C_4-alkyl)amino-C_1-C_4alkyl; R_{24} is hydrogen or methyl; and R_{25} is hydrogen or C_1-C_3alkyl.

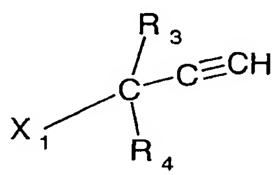
Also of importance are compounds of formula I wherein R_3 and R_4 are each independently of the other hydrogen or methyl.

The compounds of formula I can be prepared by methods known *per se* described, for example, in Tetrahedron 1997 (53), 12621-12628; Helv. Chim. Acta 2000 (83), 650-657; J. Chem. Res., Synop. 1996 (10), 462-463; Org. Prep. Proc. Int. 1995 (27), 129-160; Tetrahedron Organic Chemistry 2000 (20), 209-213; and K. Sonogashira in "Comprehensive Organic Synthesis", Editors I. Fleming *et al.*, Pergamon, Oxford 1991, Vol. 3, page 521 ff., for example by reacting a compound of formula II



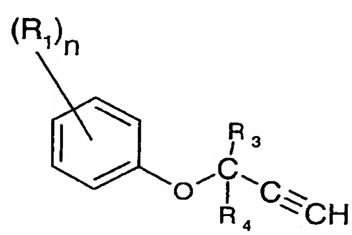
(II),

wherein R_1 and n are as defined for formula I, in the presence of a base, with a compound of formula III



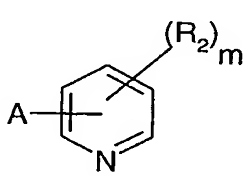
(III),

wherein R_3 and R_4 are as defined for formula I and X_1 is O-tosyl, O-mesyl, chlorine, bromine or iodine, to form a compound of formula IV

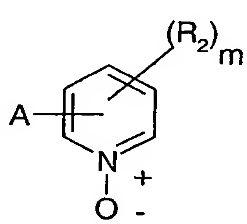


(IV),

wherein R_1, R_3, R_4 and n are as defined, and then coupling that compound with a compound of formula V or Va

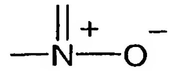


(V) or

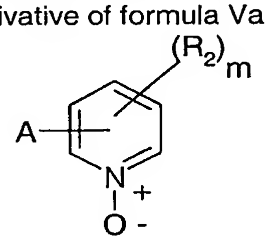


(Va),

wherein R_2 and m are as defined for formula I and A is a leaving group, e.g. halogen or trifluoromethanesulfonate, in the presence of a palladium catalyst, and, if desired, oxidising

the resulting pyridine derivative of formula I wherein Z is =N- to form the corresponding pyridine N-oxide of formula I wherein Z is .

The preparation of the compounds of formula I can be carried out e.g. according to the individual Schemes 1, 2, 3, 4 and 5. For the individual synthesis schemes it is generally true that various substituents R_2 in a compound of formula V or Va are either already present at the outset or can be introduced in succession, for example by nucleophilic or electrophilic aromatic substitution.
Similarly, the compound of formula V may at the outset already be in the form of the pyridine N-oxide derivative of formula Va



(Va)..

If desired, however, the N-oxide function can be introduced into the pyridyl ring of the compound of formula I wherein Z is =N- only at the end of the synthesis sequence, *via* oxidation by conventional methods, e.g. with hydrogen peroxide or organic peracids.

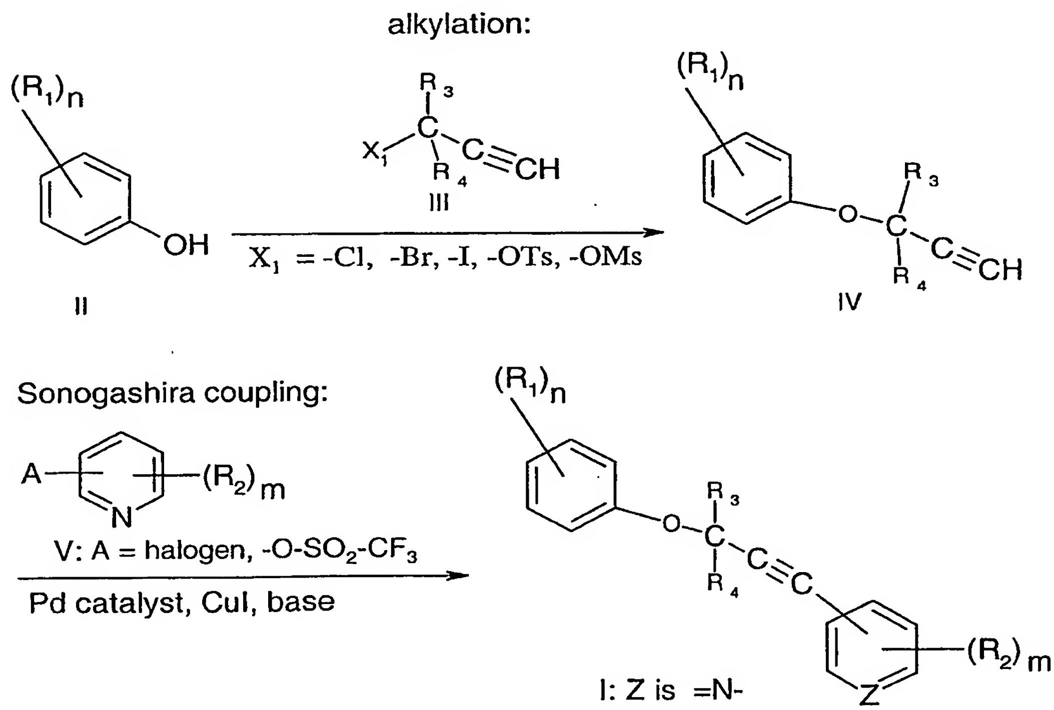
According to Reaction Scheme 1, the compounds of formula I can be obtained, for example, from substituted phenyl propargyl ethers of formula IV.

The propargyl ethers of formula IV can be obtained beforehand by etherification of phenols of formula II, which are reacted in the presence of a base with acetylene derivatives of formula III. Such etherification reactions are standard procedures and can be carried out e.g. analogously to Tetrahedron 1997 (53), 12621-12628; Helv. Chim. Acta 2000 (83), 650-657; and J. Chem. Res., Synop. 1996 (10), 462-463.

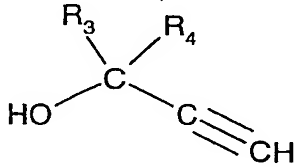
In the next step, the propargyl ethers of formula IV are coupled with substituted pyridine or pyridine N-oxide derivatives of formula V or Va, respectively, under typical Sonogashira conditions (K.Sonogashira in "Comprehensive Organic Synthesis", Editors I. Fleming *et al.*, Pergamon, Oxford 1991, Vol. 3, page 521 ff.; J. Org. Chem. 1998 (63), 8551-8553). Catalyst mixtures that come into consideration are, for example, tetrakistriphenylphosphine-palladium or bistriphenylphosphine-palladium dichloride together with copper iodide, and bases that

come into consideration (for the reductive elimination) are especially amines, for example triethylamine, diethylamine and diisopropylethylamine.
The pyridines or pyridine N-oxides of formula V or Va, respectively, preferably carry a leaving group A, wherein A is e.g. halogen or trifluoromethanesulfonate (Tetrahedron Organic Chemistry 2000 (20), 209-213; J. Org. Chem. 1997 (62), 1491-1500). As solvents for the Sonogashira reaction there are customarily used ethers, for example tetrahydrofuran, chlorinated hydrocarbons, for example chloroform, or dipolar aprotic solvents, for example dimethylformamide or dimethyl sulfoxide, or amines, for example triethylamine or piperidine.

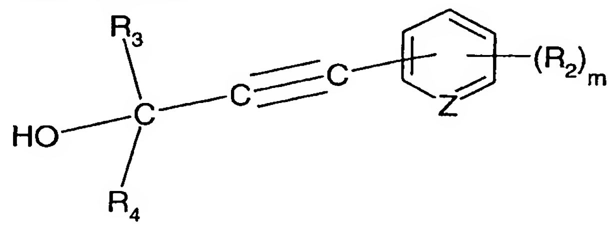
Scheme 1



The Pd-catalysed cross-coupling of suitably substituted pyridine or pyridine N-oxide derivatives of formula V or Va, respectively, with propargyl alcohols or terminal acetylenes of formula VI

 (VI),

wherein R_3 and R_4 are as defined for formula I, is known generally as the Sonogashira reaction and is shown diagrammatically in Reaction Scheme 2 for the pyridine derivatives of formula V. That reaction is documented in detail in Tetrahedron Organic Chemistry 2000 (20), 209-213 and can be used for the preparation of the pyridyl and pyridyl N-oxide propargyl alcohols of formula VII



(VII),

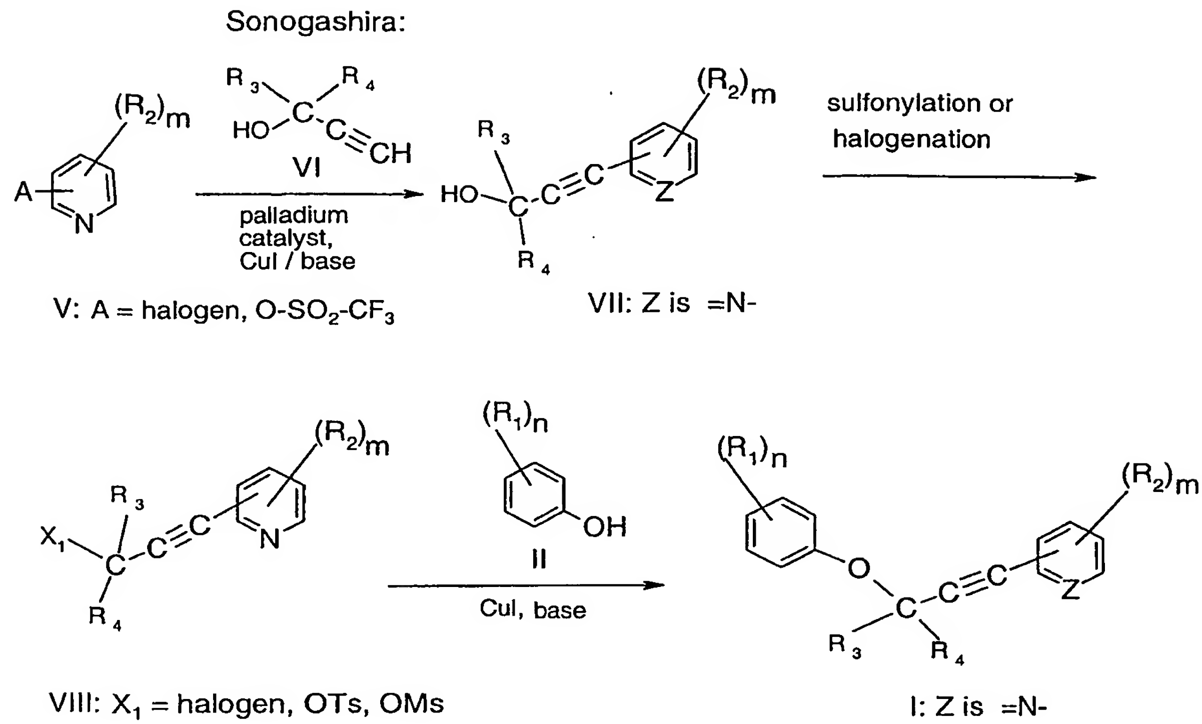
wherein R_2, R_3, R_4, Z and m are as defined for formula I.

The activation of the alcohol of formula VII (Z is =N-) is carried out e.g. by sulfonylation or halogenation according to Scheme 2. The sulfonylation of the alcohol of formula VII is a standard reaction and can be carried out e.g. with a sulfonic acid chloride, for example mesyl chloride (MsCl) or para-toluenesulfonic acid chloride (p-TsCl), in the presence of a tertiary amine, for example triethylamine, or an aromatic amine, for example pyridine, in a solvent, e.g. a chlorinated hydrocarbon, for example carbon tetrachloride or methylene chloride, or an amine, for example pyridine. Such reactions are generally known and are described e.g. in J. Org. Chem. 1997 (62), 8987; J. Het. Chem. 1995 (32), 875-882; and also in Tetrahedron Lett. 1997 (38), 8671-8674.

The halogenation of the alcohol of formula VII (Z is =N-) can be carried out analogously to standard procedures. For example, the bromination is carried out with carbon tetrabromide in the presence of triphenylphosphine (Synthesis 1998, 1015-1018) in methylene chloride. The chlorination is carried out with mineral acids, for example with concentrated hydrochloric acid (J. Org. Chem. 1955 (20), 95) or with para-toluenesulfonic acid chloride in the presence of an amine, for example triethylamine in a solvent, e.g. methylene chloride (Tetrahedron Lett. 1984 (25), 2295).

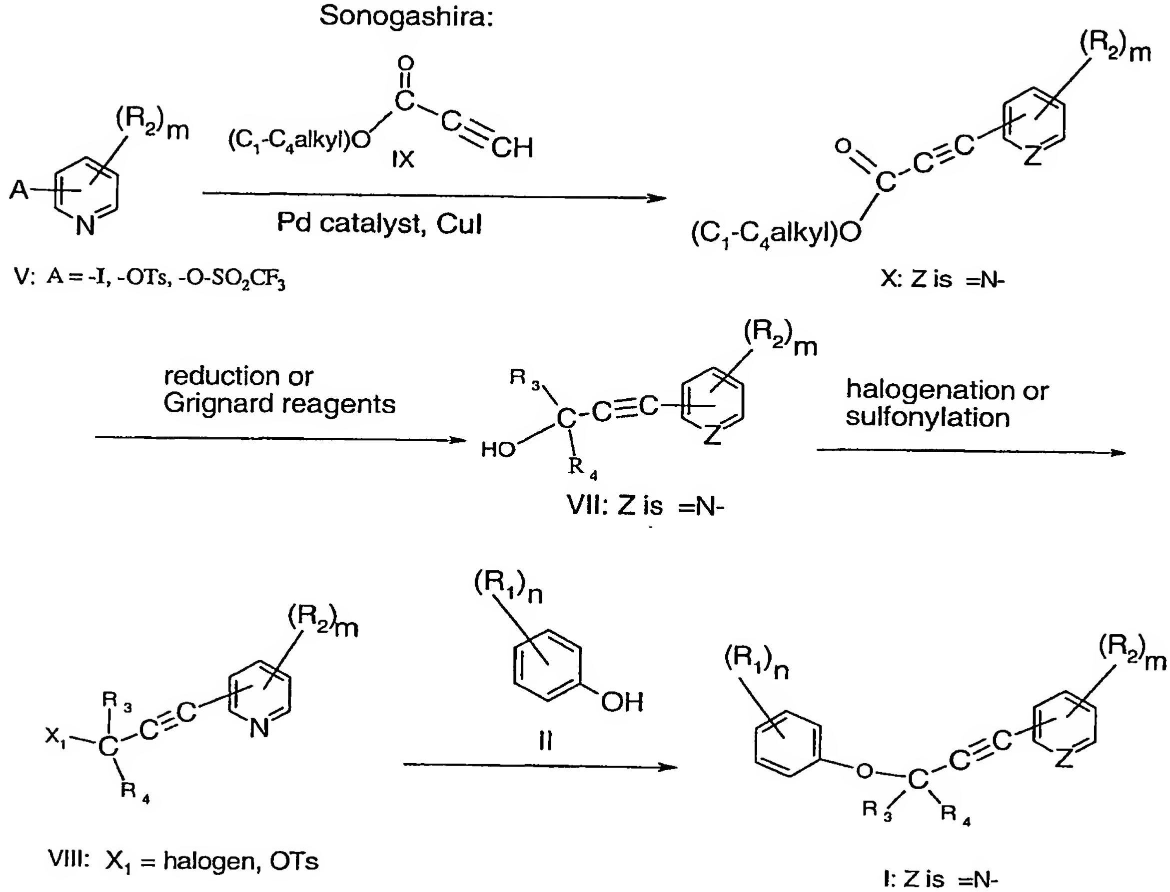
The preparation of the pyridyl-propynyloxy-benzenes of formula I (Z is =N-) can be carried out analogously to Synthesis 1995, 707-712; and Tetrahedron Lett. 1994 (35), 6405-6408 by means of copper-iodide-catalysed etherification of the phenol of formula II in the presence of the tosylate or mesylate or halide of formula VIII (according to Scheme 2). Suitable solvents are dimethylformamide and acetonitrile, and suitable bases are especially potassium carbonate and 1,8-diazabicyclo[5.4.0]undec-7-ene (DBU).

Scheme 2

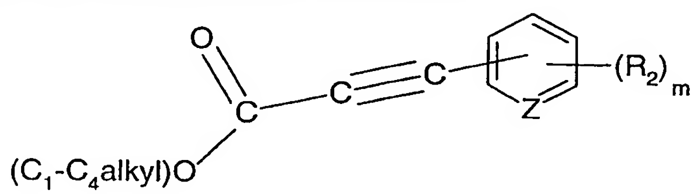


Compounds of formula I can also be obtained by further methods (according to Scheme 3).

Scheme 3

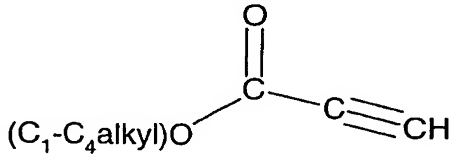


Accordingly, acetylene esters of formula X



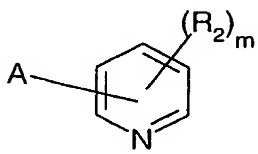
(X),

wherein R_2, Z and m are as defined for formula I, can be obtained, by means of Sonogashira coupling, from the compounds of formula IX

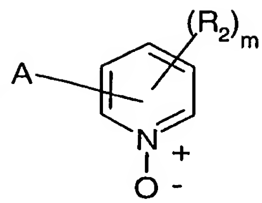


(IX)

and activated pyridine derivatives of formula V or Va

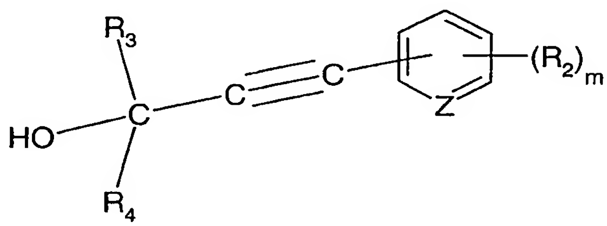


(V) or



(Va),

wherein R_2 and m are as defined and A is a leaving group as described above, analogously to Synthetic Communic. 1998 (28), 327-335. The esters of formula X can then be reduced or reacted with organometallic compounds, for example Grignard reagents, to form the alcohols of formula VII



(VII),

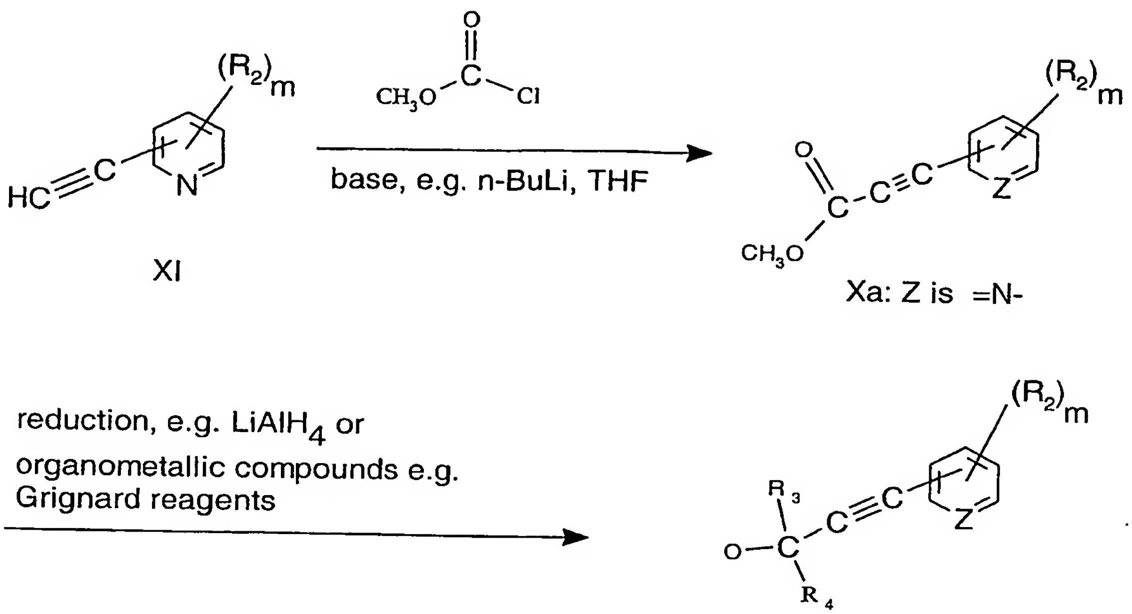
wherein R_2, Z and m are as defined for formula I and R_3 and R_4 are each independently of the other hydrogen, C_1-C_4alkyl or C_1-C_4alkoxy.

The reduction of the acetylene esters of formula X (Z is =N-) to the alcohols of formula VII (Z is =N-) can be carried out especially with hydrides by standard methods, for example with lithium aluminium hydride or sodium borohydride in a solvent, e.g. an ether, for example diethyl ether, dioxane or tetrahydrofuran, or an alcohol, for example methanol or ethanol. Such reductions are described e.g. in C. Ferri, "Reaktionen der organischen Synthese" 1978, pages 98-102.

Reactions of carboxylic acid esters with Grignard reagents are standard in organic synthesis chemistry and are described in detail in "Organikum" 1976, pages 617-625. The subsequent etherification of the phenol derivatives of formula II in the presence of a compound of formula VIII to form the compounds of formula I has already been described in detail in Scheme 2.

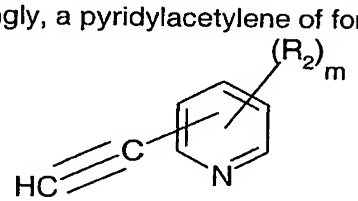
Further methods of preparing the desired compounds of formula I are shown in Scheme 4 (variant of Scheme 3).

Scheme 4



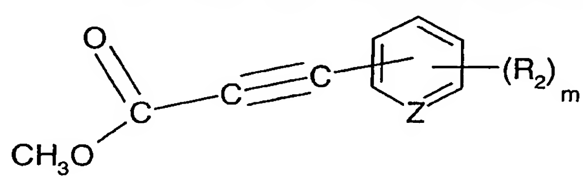
VII: Z is =N-

Accordingly, a pyridylacetylene of formula XI



(XI),

wherein R_2 and m are as defined for formula I, is reacted with n-butyllithium (n-BuLi) and then with a chloroformic acid methyl ester to form an ester of formula Xa

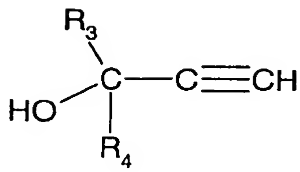


(Xa),

wherein Z is =N-.

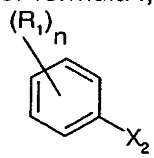
That ester can be converted into the desired compound of formula I entirely analogously to the method already described in Scheme 3, *via* an alcohol of formula VII (Z is =N-) (analogously to J. Org. Chem. 1988 (53), 4166-4171).

The compounds of formula I can also be prepared by first reacting the propargyl alcohols of formula VI



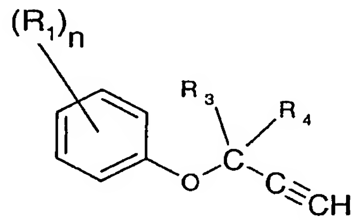
(VI),

wherein R_3 and R_4 are as defined for formula I, with activated phenyl halides of formula XII



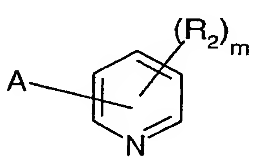
(XII),

wherein X_2 is halogen, n is 1, 2, 3, 4 or 5 and R_1 is a substituent having an electron-withdrawing effect (–M and/or –I effect), e.g. $-NO_2$, -CN, CF_3 or COR_{12}, to form compounds of formula IV

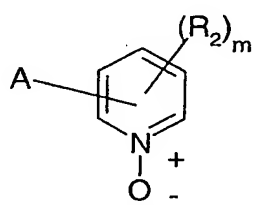


(IV),

wherein R_1, R_3, R_4 and n are as defined, and then in the next synthesis step carrying out a Sonogashira reaction with activated pyridine or pyridine N-oxide derivatives of formula V or Va



(V) or

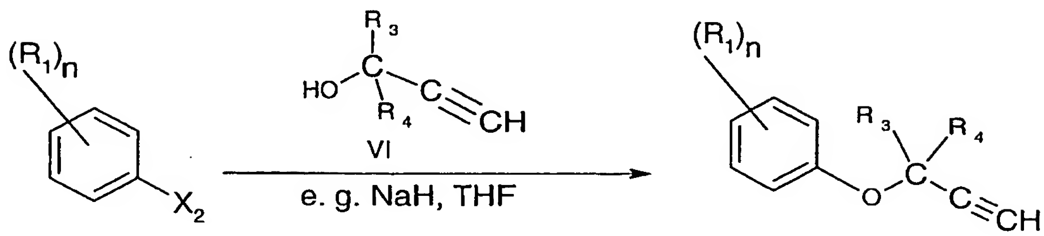


(Va),

wherein R_2 and m are as defined for formula I and A is a leaving group, e.g. halogen or trifluoromethanesulfonate (Reaction Scheme 5).

Scheme 5

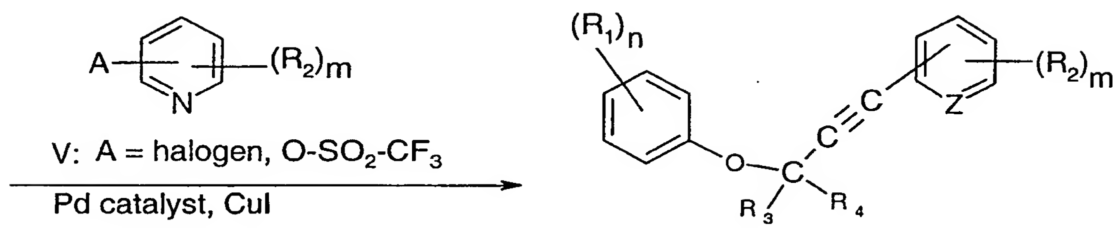
nucleophilic substitution:



XII: X_2 = halogen

IV

Sonogashira couplung:



I: Z is =N-

The following comments apply to the individual reaction steps in Schemes 1 to 5:
The reactions to form compounds of formula I are advantageously performed in aprotic, inert organic solvents. Such solvents are hydrocarbons, such as benzene, toluene, xylene or cyclohexane, chlorinated hydrocarbons, such as dichloromethane, trichloromethane, tetrachloromethane and chlorobenzene, ethers, such as diethyl ether, ethylene glycol dimethyl ether, diethylene glycol dimethyl ether, tetrahydrofuran and dioxane, nitriles, such as acetonitrile and propionitrile, amides, such as N,N-dimethylformamide, diethylformamide and N-methylpyrrolidinone. The reaction temperatures are preferably from -20°C to +120°C. The reactions generally proceed slightly exothermically and can generally be carried out at room temperature. In order to shorten the reaction time or alternatively to initiate the reaction, the reaction mixture may, if appropriate, be heated to its boiling point for a short time. The reaction times may likewise be shortened by the addition of a few drops of base as reaction catalyst. Suitable bases are especially tertiary amines, such as trimethylamine, triethylamine, quinuclidine, 1,4-diazabicyclo[2.2.2]octane, 1,5-diazabicyclo[4.3.0]non-5-ene and 1,5-diazabicyclo[5.4.0]undec-7-ene, but it is also possible to use inorganic bases, such as hydrides,

e.g. sodium or calcium hydride, hydroxides, such as sodium or potassium hydroxide, carbonates, such as sodium or potassium carbonate, or hydrogen carbonates, such as potassium or sodium hydrogen carbonate.

The compounds of formula I can be isolated in customary manner by concentration and/or evaporation of the solvent and can be purified by recrystallisation or trituration of the solid residue in solvents in which they are not readily soluble, such as ethers, aromatic hydrocarbons or chlorinated hydrocarbons.

The starting compounds of formulae II, III, V, VI, IX, XI and XII used in Schemes 1 to 5 are known, in some cases are commercially available or can be prepared analogously to described standard methods. For example, the compounds of formula V are described in Tetrahedron Organic Chemistry 20, 209 (2000).

For the use according to the invention of the compounds of formula I, or of compositions comprising them, there come into consideration all methods of application customary in agriculture, for example pre-emergence application, post-emergence application and seed dressing, and also various methods and techniques such as, for example, the controlled release of active ingredient. For that purpose a solution of the active ingredient is applied to mineral granule carriers or polymerised granules (urea/formaldehyde) and dried. If required, it is also possible to apply a coating (coated granules), which allows the active ingredient to be released in metered amounts over a specific period of time.

The compounds of formula I may be used as herbicides in their unmodified form, that is to say as obtained in the synthesis, but they are preferably formulated in customary manner together with the adjuvants conventionally employed in formulation technology, for example into emulsifiable concentrates, directly sprayable or dilutable solutions, dilute emulsions, wettable powders, soluble powders, dusts, granules or microcapsules. Such formulations are described, for example, on pages 9 to 13 of WO 97/34485. As with the nature of the compositions, the methods of application, such as spraying, atomising, dusting, wetting, scattering or pouring, are chosen in accordance with the intended objectives and the prevailing circumstances.

The formulations, that is to say the compositions, preparations or mixtures comprising the compound (active ingredient) of formula I or at least one compound of formula I and, usually, one or more solid or liquid formulation adjuvants, are prepared in known manner, e.g. by

homogeneously mixing and/or grinding the active ingredients with the formulation adjuvants, for example solvents or solid carriers. Surface-active compounds (surfactants) may also be used in addition in the preparation of the formulations. Examples of solvents and solid carriers are given, for example, on page 6 of WO 97/34485.

Depending upon the nature of the compound of formula I to be formulated, suitable surface-active compounds are non-ionic, cationic and/or anionic surfactants and surfactant mixtures having good emulsifying, dispersing and wetting properties. Examples of suitable anionic, non-ionic and cationic surfactants are listed, for example, on pages 7 and 8 of WO 97/34485. In addition, the surfactants conventionally employed in formulation technology, which are described, *inter alia*, in "McCutcheon's Detergents and Emulsifiers Annual" MC Publishing Corp., Ridgewood New Jersey, 1981, Stache, H., "Tensid-Taschenbuch", Carl Hanser Verlag, Munich/Vienna 1981, and M. and J. Ash, "Encyclopedia of Surfactants", Vol. I-III, Chemical Publishing Co., New York, 1980-81, are also suitable for the preparation of the herbicidal compositions according to the invention.

The herbicidal formulations generally contain from 0.1 to 99 % by weight, especially from 0.1 to 95 % by weight, of herbicide, from 1 to 99.9 % by weight, especially from 5 to 99.8 % by weight, of a solid or liquid formulation adjuvant, and from 0 to 25 % by weight, especially from 0.1 to 25 % by weight, of a surfactant. Whereas commercial products will preferably be formulated as concentrates, the end user will normally employ dilute formulations. The compositions may also comprise further ingredients, such as stabilisers, for example vegetable oils or epoxidised vegetable oils (epoxidised coconut oil, rapeseed oil or soybean oil), anti-foams, for example silicone oil, preservatives, viscosity regulators, binders, tackifiers, and also fertilisers or other active ingredients.

The compounds of formula I are generally applied to plants or the locus thereof at rates of application of from 0.001 to 4 kg/ha, especially from 0.005 to 2 kg/ha. The concentration required to achieve the desired effect can be determined by experiment. It is dependent on the nature of the action, the stage of development of the cultivated plant and of the weed and on the application (place, time, method) and may vary within wide limits as a function of those parameters.

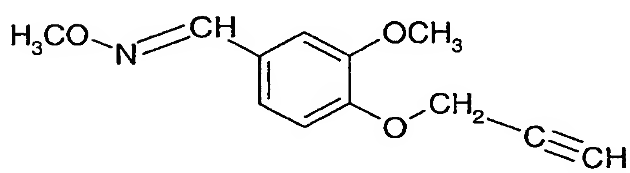
The compounds of formula I are distinguished by herbicidal and growth-inhibiting properties, allowing them to be used in crops of useful plants, especially cereals, cotton, soybeans, sugar beet, sugar cane, plantation crops, rape, maize and rice, and also for non-selective

weed control. The term "crops" is to be understood as including also crops that have been made tolerant to herbicides or classes of herbicides as a result of conventional methods of breeding or genetic techniques. The weeds to be controlled may be either monocotyledonous or dicotyledonous weeds, such as, for example, Stellaria, Nasturtium, Agrostis, Digitaria, Avena, Setaria, Sinapis, Lolium, Solanum, Echinochloa, Scirpus, Monochoria, Sagittaria, Bromus, Alopecurus, Sorghum halepense, Panicum, Rottboellia, Cyperus, Abutilon, Sida, Xanthium, Amaranthus, Chenopodium, Ipomoea, Chrysanthemum, Galium, Viola and Veronica.

The following Examples further illustrate but do not limit the invention.

Preparation Examples:

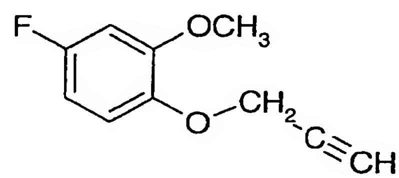
Example P1: Preparation of 3-methoxy–4-prop-2-ynyloxy-benzaldehyde O-methyl-oxime



5.0 g (26.3 mmol) of 3-methoxy–4-(2-propynyloxy)-benzaldehyde (see DE-A-4 141 401) are dissolved at 20°C in 20 ml of ethanol under nitrogen. Then, with stirring, 2.86 g (34.3 mmol) of O-methyl-hydroxylamine hydrochloride and 4.65 g (34.2 mmol) of anhydrous sodium acetate are added in succession thereto. After the addition, stirring is carried out for a further 18 hours at 20°C and 1.5 hours at about 50°C. The solvent is then distilled off, 100 ml of water are added to the residue and extraction is carried out three times with a total of 100 ml of dichloromethane. The combined organic phases are dried over magnesium sulfate. After evaporating off the solvent, 5.37 g of the desired target compound 3-methoxy–4-prop-2-ynyloxy-benzaldehyde O-methyl-oxime are obtained in the form of yellow crystals having a melting point of 68-69°C.

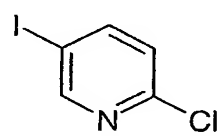
^{1}H-NMR ($CDCl_3$): δ (ppm) = 2.53 (t); 3.92 (s); 3.97 (s); 4.80 (t); 7.00 (s); 7.29 (s); 8.00 (s).

Example P2: Preparation of 4-fluoro-2-methoxy-1-prop-2-ynyloxy-benzene



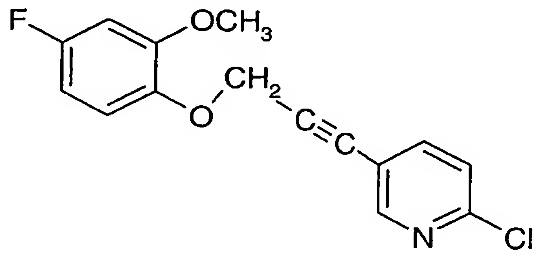
80.0 g (0.563 mol) of 4-fluoro-2-methoxyphenol are dissolved at 20°C in 2 litres of acetone. 80.0 g of potassium carbonate are added and stirring is carried out at 20°C for 1 hour. Then, in the course of 30 minutes, 82.7 ml of propargyl bromide are added dropwise, with stirirng, and the resulting suspension is heated at reflux temperature. When the reaction is complete, the solvent is distilled off and the residue is taken up in ether. The ether phase is washed three times with 1N NaOH, twice with water and twice with saturated brine. A small amount of toluene is then added to the ether phase and the reaction mixture is finally completely concentrated by evaporation. 171.6 g of the desired target compound 4-fluoro-2-methoxy-1-prop-2-ynyloxy-benzene are obtained in the form of a light-brown oil.
^{1}H-NMR ($CDCl_3$): δ (ppm) = 2.52 (s); 3.86 (s); 4.72 (s); 6.58-6.72 (m); 6.95-7.05 (m).

Example P3: 2-Chloro-5-iodopyridine



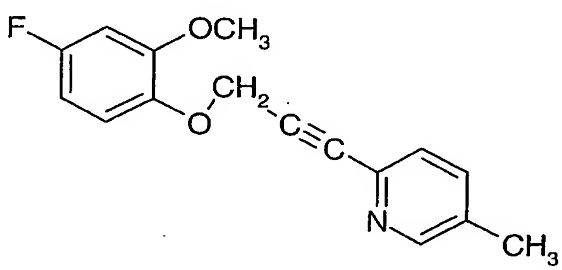
22.1 g (0.1 mol) of 2-hydroxy-5-iodo-pyridine are heated together with 31.0 g (0.2 mol) of phosphorus oxytrichloride ($POCl_3$) for 1 hour at reflux temperature. When the reaction is complete, excess $POCl_3$ is distilled off and the residue is taken up in toluene. The organic phase is stirred with aqueous potassium carbonate solution, separated and concentrated by evaporation. The crude product is purified by chromatography over silica gel. 19 g of the desired title compound are obtained in the form of colourless crystals.
^{1}H-NMR ($CDCl_3$): δ (ppm) = 7.10-7.20 (d); 7.90-8.00 (dxd); 8.55-8.65 (d).

Example P4: 2-Chloro-5-[3-(4-fluoro-2-methoxy-phenoxy)-prop-1-ynyl]-pyridine



300 mg (1.25 mmol) of 2-chloro-5-iodo-pyridine (Example P3), 339 mg (1.87 mmol) of 4-fluoro-2-methoxy-1-prop-2-ynyloxy-benzene (Example P2) and 48 mg (0.25 mmol) of copper(I) iodide (CuI) are suspended in a mixture consisting of 4 ml of dioxane and 3 ml of diisopropylamine under argon at 20°C. The resulting reaction mixture is heated to 50°C and 88 mg (0.125 mmol) of $Pd(PPh_3)_2Cl_2$ are added. After 3.5 hours, the reaction mixture is cooled to 20°C. The solvent mixture is distilled off *in vacuo* and the crude product is subjected to flash chromatography over silica gel (eluant: ethyl acetate/petroleum ether 1/5). 308 mg of the desired target compound 2-chloro-5-[3-(4-fluoro-2-methoxy-phenoxy)-prop-1-ynyl]-pyridine are obtained in the form of a beige solid having a melting point of 86-87°C. ^{1}H-NMR ($CDCl_3$): δ (ppm) = 3.87 (s); 4.93 (s); 6.56-6.70 (m); 6.97-7.02 (dxd); 7.28 (d); 7.64 (dxd); 8.42 (d).

Example P5: 2-[3-(4-Fluoro-2-methoxy-phenoxy)-prop-1-ynyl]-5-methyl-pyridine

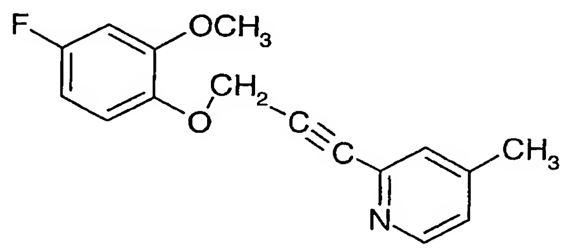


200 mg (1.16 mmol) of 2-bromo-5-methyl-pyridine, 314 mg (1.74 mmol) of 4-fluoro-2-methoxy-1-prop-2-ynyloxy-benzene (Example P2) and 44 mg (0.23 mmol) of copper(I) iodide (CuI) are suspended in a mixture consisting of 4 ml of dioxane and 3 ml of diisopropylamine under argon at 20°C. The reaction mixture is heated to 50°C and 81 mg (0.12 mmol) of $Pd(PPh_3)_2Cl_2$ are added. After 4 hours, the reaction mixture is cooled to 20°C. The solvent mixture is distilled off *in vacuo* and the resulting crude product is purified by chromatography over silica gel (eluant: ethyl acetate/petroleum ether 1/3). 208 mg of the desired target com-

pound 2-[3-(4-fluoro-2-methoxy-phenoxy)-prop-1-ynyl]-5-methyl-pyridine are obtained in the form of a brown oil.

^{1}H-NMR ($CDCl_3$): δ (ppm) = 2.33 (s); 3.86 (s); 4.95 (s); 6.55-6.68 (m); 7.05 (dxd); 7.29 (d); 7.43 (dxd); 8.40 (d).

Example P6: 2-[3-(4-Fluoro-2-methoxy-phenoxy)-prop-1-ynyl]-4-methyl-pyridine

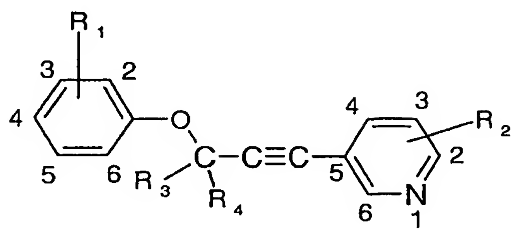


200 mg (1.16 mmol) of 2-bromo-4-methyl-pyridine, 314 mg (1.74 mmol) of 4-fluoro-2-methoxy-1-prop-2-ynyloxy-benzene (Example P2) and 44 mg (0.23 mmol) of copper(I) iodide (CuI) are suspended in a mixture consisting of 4 ml of dioxane and 3 ml of diisopropylamine under argon at 20°C. The reaction mixture is heated to 50°C and 81 mg (0.12 mmol) of $Pd(PPh_3)_2Cl_2$ are added. After 4 hours, the reaction mixture is cooled to 20°C. The solvent mixture is distilled off *in vacuo* and the resulting crude product is purified by chromatography over silica gel (eluant: ethyl acetate/petroleum ether 1/3). 152 mg of the desired target compound 2-[3-(4-fluoro-2-methoxy-phenoxy)-prop-1-ynyl]-4-methyl-pyridine are obtained in the form of a brown solid.

^{1}H-NMR ($CDCl_3$): δ (ppm) = 2.32 (s); 3.87 (s); 4.95 (s); 6.56-6.68 (m); 7.03-7.08 (m); 7.23 (s); 8.41 (d).

In a manner analogous to that described in Examples P1 to P5 or in accordance with the methods as shown in Reaction Schemes 1-5 and in the references indicated, it is also possible to obtain the preferred compounds listed in the following Tables. In the column headed "Phys. data", the temperatures indicate the melting point (m.p.) of the compounds in question. In cases where the purity of the compounds has been investigated by means of HPLC/MS ("High Pressure Liquid Chromatography/Electrospray Mass Spectrometry"), the column headed "Phys. data" gives the $[M+H]^+$ peak from the Electrospray-MS of the compound in question (e.g. Comp. No. 3.011).

Table 1: Compounds of formula I_1



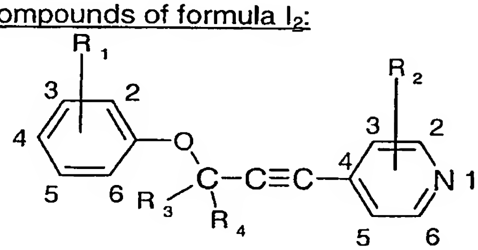
Comp. No.	R_1	R_2	R_3	R_4	Phys. data m.p. (°C)
1.001	2-OCH_3, 4-CN	2-Cl	H	H	160-161
1.002	2-F, 4-Cl	2-Cl	H	H	
1.003	2-Cl, 4-Cl	2-Cl	H	H	
1.004	2-OCH_3, 4-F	2-Cl	H	H	86-87
1.005	2-OCH_3, 4-Cl	2-Cl	H	H	
1.006	2-OCH_3, 4-Br	2-Cl	H	H	
1.007	2-CF_3, 4-F	2-Cl	H	H	
1.008	2-OCH_3, 4-CF_3	2-Cl	H	H	
1.009	2-OCH_3, 4-CH_3	2-Cl	H	H	
1.010	2-OCH_3, 4-CH=$NOCH_3$	2-Cl	H	H	97-99
1.011	2-OCH_3, 5-CH=$NOCH_3$	2-Cl	H	H	128-129
1.012	3-CF_3	2-$OCH_2CH_2N(C_2H_5)_2$	H	H	oil
1.013	4-OCH_3	2-$OCH_2CH_2N(C_2H_5)_2$	H	H	oil
1.014	H	2-$OCH_2CH_2N(C_2H_5)_2$	H	H	oil
1.015	2-Cl	2-$OCH_2CH_2N(C_2H_5)_2$	H	H	oil
1.016	4-Cl	2-$OCH_2CH_2N(C_2H_5)_2$	H	H	oil
1.017	3-Cl	2-$OCH_2CH_2N(C_2H_5)_2$	H	H	oil
1.018	2-OCH_3, 4-F	H	H	H	78-79
1.019	2-OCH_3, 4-CN	2-Cl	CH_3	H	-
1.020	2-F, 4-Cl	2-Cl	CH_3	H	-
1.021	2-Cl, 4-Cl	2-Cl	CH_3	H	-
1.022	2-OCH_3, 4-F	2-Cl	CH_3	H	-
1.023	2-OCH_3, 4-Cl	2-Cl	CH_3	H	-
1.024	2-OCH_3, 4-Br	2-Cl	CH_3	H	-
1.025	2-CF_3, 4-F	2-Cl	CH_3	H	-
1.026	2-OCH_3, 4-CF_3	2-Cl	CH_3	H	-
1.027	2-OCH_3, 4-CH_3	2-Cl	CH_3	H	-

Comp. No.	R_1	R_2	R_3	R_4	Phys. data m.p. (°C)
1.028	2-OCH_3, 4-CH=$NOCH_3$	2-Cl	CH_3	H	-
1.029	2-OCH_3, 4-CH=$NOCH_3$	2-NH_2	H	H	135-138
1.030	2-OCH_3, 4-F	2-NH_2	H	H	-
1.031	2-OCH_3, 4-Cl	2-NH_2	H	H	-
1.032	2-OCH_3, 4-CN	3-Br	H	H	-
1.033	2-F, 4-Cl	3-Br	H	H	-
1.034	2-Cl, 4-Cl	3-Br	H	H	-
1.035	2-OCH_3, 4-F	3-Br	H	H	72-74
1.036	2-OCH_3, 4-Cl	3-Br	H	H	-
1.037	2-OCH_3, 4-Br	3-Br	H	H	-
1.038	2-CF_3, 4-F	3-Br	H	H	-
1.039	2-OCH_3, 4-CF_3	3-Br	H	H	-
1.040	2-OCH_3, 4-CH_3	3-Br	H	H	-
1.041	2-OCH_3, 4-CH=$NOCH_3$	3-Br	H	H	102-104
1.042	2-OCH_3, 4-CH=$NOCH_3$	3-Br, 6-OH	H	H	crystalline
1.043	2-OCH_3, 4-F	3-Br, 6-OH	H	H	crystalline
1.044	2-OCH_3, 4-CN	3-CH_2CN	H	H	-
1.045	2-F, 4-Cl	3-CH_2CN	H	H	-
1.046	2-Cl, 4-Cl	3-CH_2CN	H	H	-
1.047	2-OCH_3, 4-F	3-CH_2CN	H	H	-
1.048	2-OCH_3, 4-Cl	3-CH_2CN	H	H	-
1.049	2-OCH_3, 4-Br	3-CH_2CN	H	H	-
1.050	2-CF_3, 4-F	3-CH_2CN	H	H	-
1.051	2-OCH_3, 4-CF_3	3-CH_2CN	H	H	-
1.052	2-OCH_3, 4-CH_3	3-CH_2CN	H	H	-
1.053	2-OCH_3, 4-CH=$NOCH_3$	3-CH_2CN	H	H	-
1.054	2-OCH_3, 4-F	3-OCH_3, 6-NHC(O)O-t-C_4H_9	H	H	crystalline
1.055	2-OCH_3, 4-CH=$NOCH_3$	3-OCH_3, 6-NHC(O)O-t-C_4H_9	H	H	crystalline
1.056	2-OCH_3, 4-F	3-OCH_3, 6-NH_2	H	H	amorphous
1.057	2-OCH_3, 4-CH=$NOCH_3$	3-OCH_3, 6-NH_2	H	H	crystalline
1.058	2-OCH_3, 4-CN	3-Cl	H	H	-
1.059	2-F, 4-Cl	3-Cl	H	H	-

Comp. No.	R_1	R_2	R_3	R_4	Phys. data m.p. (°C)
1.060	2-Cl, 4-Cl	3-Cl	H	H	-
1.061	2-OCH_3, 4-F	3-Cl	H	H	-
1.062	2-OCH_3, 4-Cl	3-Cl	H	H	-
1.063	2-OCH_3, 4-Br	3-Cl	H	H	-
1.064	2-CF_3, 4-F	3-Cl	H	H	-
1.065	2-OCH_3, 4-CF_3	3-Cl	H	H	-
1.066	2-OCH_3, 4-CH_3	3-Cl	H	H	-
1.067	2-OCH_3, 4-CH=$NOCH_3$	3-Cl	H	H	-
1.068	2-OCH_3, 4-F	3-Cl, 6-OH	H	H	-
1.069	2-OCH_3, 4-CH=$NOCH_3$	3-Cl, 6-OH	H	H	crystalline
1.070	2-OCH_3, 4-CN	3-$CH(CH_3)CN$	H	H	-
1.071	2-F, 4-Cl	3-$CH(CH_3)CN$	H	H	-
1.072	2-Cl, 4-Cl	3-$CH(CH_3)CN$	H	H	-
1.073	2-OCH_3, 4-F	3-$CH(CH_3)CN$	H	H	-
1.074	2-OCH_3, 4-Cl	3-$CH(CH_3)CN$	H	H	-
1.075	2-OCH_3, 4-Br	3-$CH(CH_3)CN$	H	H	-
1.076	2-CF_3, 4-F	3-$CH(CH_3)CN$	H	H	-
1.077	2-OCH_3, 4-CF_3	3-$CH(CH_3)CN$	H	H	-
1.078	2-OCH_3, 4-CH_3	3-$CH(CH_3)CN$	H	H	-
1.079	2-OCH_3, 4-CH=$NOCH_3$	3-$CH(CH_3)CN$	H	H	-
1.080	2-OCH_3, 4-F	3-CH_2CN	CH_3	CH_3	-
1.081	2-OCH_3, 4-Cl	3-CH_2CN	CH_3	CH_3	-
1.082	2-OCH_3, 4-Br	3-CH_2CN	CH_3	CH_3	-
1.083	2-OCH_3, 4-CN	3-CH_3	H	H	-
1.084	2-F, 4-Cl	3-CH_3	H	H	-
1.085	2-Cl, 4-Cl	3-CH_3	H	H	-
1.086	2-OCH_3, 4-F	3-CH_3	H	H	-
1.087	2-OCH_3, 4-Cl	3-CH_3	H	H	-
1.088	2-OCH_3, 4-Br	3-CH_3	H	H	-
1.089	2-CF_3, 4-F	3-CH_3	H	H	-
1.090	2-OCH_3, 4-CF_3	3-CH_3	H	H	-
1.091	2-OCH_3, 4-CH_3	3-CH_3	H	H	-
1.092	2-OCH_3, 4-CH=$NOCH_3$	3-CH_3	H	H	-
1.093	2-OCH_3	3-CH_2CN	H	H	-

Comp. No.	R_1	R_2	R_3	R_4	Phys. data m.p. (°C)
1.094	2-OCH_3	4-CH_2CN	H	H	-
1.095	2-OCH_3	3-F	H	H	-
1.096	2-OCH_3	3-Cl	H	H	-
1.097	2-OCH_3	3-Br	H	H	-
1.098	2-OCH_3, 4-F	2-OCH_3	H	H	66-68
1.099	2-OCH_3, 4-CH=$NOCH_3$	2-CH_3	H	H	resin
1.100	2-OCH_3, 4-F	2-CH_3	H	H	resin
1.101	2-OCH_3, 4-CH=$NOCH_3$	2-CN	H	H	crystalline
1.102	2-OCH_3, 4-CH=$NOCH_3$	3-OCH_3	H	H	resin
1.103	2-OCH_3, 4-F	3-OCH_3	H	H	resin
1.104	2-OCH_3, 4-F	2-CN	H	H	oil

Table 2: Compounds of formula I_2:



(I_2)

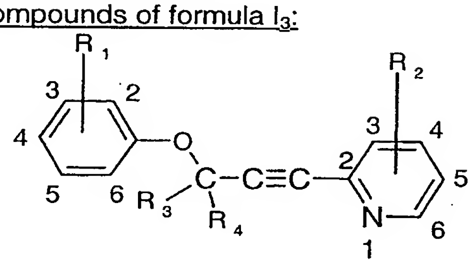
Comp. No.	R_1	R_2	R_3	R_4	Phys. data m.p. (°C)
2.001	2-OCH_3, 4-CN	2-F	H	H	132-134
2.002	2-F, 4-Cl	2-F	H	H	-
2.003	2-Cl, 4-Cl	2-F	H	H	-
2.004	2-OCH_3, 4-F	2-F	H	H	resin
2.005	2-OCH_3, 4-Cl	2-F	H	H	-
2.006	2-OCH_3, 4-Br	2-F	H	H	-
2.007	2-CF_3, 4-F	2-F	H	H	-
2.008	2-OCH_3, 4-CF_3	2-F	H	H	-
2.009	2-OCH_3, 4-CH_3	2-F	H	H	-
2.010	2-OCH_3, 4-CH=$NOCH_3$	2-F	H	H	amorphous
2.011	2-OCH_3, 4-F	H	H	H	crystalline
2.012	2-OCH_3, 4-CH=$NOCH_3$	H	H	H	crystalline
2.013	2-OCH_3, 4-CN	2-OCH_3	H	H	-
2.014	2-F, 4-Cl	2-OCH_3	H	H	-
2.015	2-Cl, 4-Cl	2-OCH_3	H	H	-

Comp. No.	R_1	R_2	R_3	R_4	Phys. data m.p. (°C)
2.016	2-OCH$_3$, 4-F	2-OCH$_3$	H	H	-
2.017	2-OCH$_3$, 4-Cl	2-OCH$_3$	H	H	-
2.018	2-OCH$_3$, 4-Br	2-OCH$_3$	H	H	-
2.019	2-CF$_3$, 4-F	2-OCH$_3$	H	H	-
2.020	2-OCH$_3$, 4-CF$_3$	2-OCH$_3$	H	H	-
2.021	2-OCH$_3$, 4-CH$_3$	2-OCH$_3$	H	H	-
2.022	2-OCH$_3$, 4-CH=NOCH$_3$	2-OCH$_3$	H	H	-
2.023	2-OCH$_3$, 4-F	2-OCH$_3$, 5-NH$_2$	H	H	amorphous
2.024	2-OCH$_3$, 4-CH=NOCH$_3$	2-OCH$_3$, 5-NH$_2$	H	H	amorphous
2.025	2-OCH$_3$, 4-F	2-OCH$_3$, 5-NHC(O)O-t-C$_4$H$_9$	H	H	oil
2.026	2-OCH$_3$, 4-CH=NOCH$_3$	2-OCH$_3$, 5-NHC(O)O-t-C$_4$H$_9$	H	H	crystalline
2.027	2-OCH$_3$, 4-CN	2-Cl	H	H	-
2.028	2-F, 4-Cl	2-Cl	H	H	-
2.029	2-Cl, 4-Cl	2-Cl	H	H	-
2.030	2-OCH$_3$, 4-F	2-Cl	H	H	-
2.031	2-OCH$_3$, 4-Cl	2-Cl	H	H	-
2.032	2-OCH$_3$, 4-Br	2-Cl	H	H	-
2.033	2-CF$_3$, 4-F	2-Cl	H	H	-
2.034	2-OCH$_3$, 4-CF$_3$	2-Cl	H	H	-
2.035	2-OCH$_3$, 4-CH$_3$	2-Cl	H	H	-
2.036	2-OCH$_3$, 4-CH=NOCH$_3$	2-Cl	H	H	-
2.037	2-OCH$_3$, 4-CN	2-CH$_2$CN	H	H	-
2.038	2-F, 4-Cl	2-CH$_2$CN	H	H	-
2.039	2-Cl, 4-Cl	2-CH$_2$CN	H	H	-
2.040	2-OCH$_3$, 4-F	2-CH$_2$CN	H	H	83-84
2.041	2-OCH$_3$, 4-Cl	2-CH$_2$CN	H	H	-
2.042	2-OCH$_3$, 4-Br	2-CH$_2$CN	H	H	-
2.043	2-CF$_3$, 4-F	2-CH$_2$CN	H	H	-
2.044	2-OCH$_3$, 4-CF$_3$	2-CH$_2$CN	H	H	-
2.045	2-OCH$_3$, 4-CH$_3$	2-CH$_2$CN	H	H	-
2.046	2-OCH$_3$, 4-CH=NOCH$_3$	2-CH$_2$CN	H	H	resin
2.047	2-OCH$_3$, 4-CN	2-N(CH$_3$)$_2$	H	H	142-144

Comp. No.	R_1	R_2	R_3	R_4	Phys. data m.p. (°C)
2.048	2-F, 4-Cl	2-$N(CH_3)_2$	H	H	-
2.049	2-Cl, 4-Cl	2-$N(CH_3)_2$	H	H	-
2.050	2-OCH_3, 4-F	2-$N(CH_3)_2$	H	H	
2.051	2-OCH_3, 4-Cl	2-$N(CH_3)_2$	H	H	-
2.052	2-OCH_3, 4-Br	2-$N(CH_3)_2$	H	H	-
2.053	2-CF_3, 4-F	2-$N(CH_3)_2$	H	H	-
2.054	2-OCH_3, 4-CF_3	2-$N(CH_3)_2$	H	H	-
2.055	2-OCH_3, 4-CH_3	2-$N(CH_3)_2$	H	H	-
2.056	2-OCH_3, 4-CH=$NOCH_3$	2-$N(CH_3)_2$	H	H	-
2.057	2-OCH_3, 4-CN	2-$CH(CH_3)CN$	H	H	-
2.058	2-F, 4-Cl	2-$CH(CH_3)CN$	H	H	-
2.059	2-Cl, 4-Cl	2-$CH(CH_3)CN$	H	H	-
2.060	2-OCH_3, 4-F	2-$CH(CH_3)CN$	H	H	-
2.061	2-OCH_3, 4-Cl	2-$CH(CH_3)CN$	H	H	-
2.062	2-OCH_3, 4-Br	2-$CH(CH_3)CN$	H	H	-
2.063	2-CF_3, 4-F	2-$CH(CH_3)CN$	H	H	-
2.064	2-OCH_3, 4-CF_3	2-$CH(CH_3)CN$	H	H	-
2.065	2-OCH_3, 4-CH_3	2-$CH(CH_3)CN$	H	H	-
2.066	2-OCH_3, 4-CH=$NOCH_3$	2-$CH(CH_3)CN$	H	H	-
2.067	2-OCH_3, 4-F	2-Cl	CH_3	H	-
2.068	2-OCH_3, 4-Cl	2-Cl	CH_3	H	-
2.069	2-OCH_3, 4-Br	2-Cl	CH_3	H	-
2.070	2-OCH_3, 4-CF_3	2-Cl	CH_3	H	-
2.071	2-OCH_3, 4-CH=$NOCH_3$	2-Cl	CH_3	H	-
2.072	2-OCH_3, 4-F	2-CH_2CN	CH_3	CH_3	-
2.073	2-OCH_3, 4-Cl	2-CH_2CN	CH_3	CH_3	-
2.074	2-OCH_3, 4-Br	2-CH_2CN	CH_3	CH_3	-
2.075	2-OCH_3, 4-CF_3	2-CH_2CN	CH_3	CH_3	-
2.076	2-OCH_3, 4-CH=$NOCH_3$	2-CH_2CN	CH_3	CH_3	-
2.077	2-OCH_3, 4-F	2-CH_2CN	CH_3	H	-
2.078	2-OCH_3, 4-Cl	2-CH_2CN	CH_3	H	-
2.079	2-OCH_3, 4-Br	2-CH_2CN	CH_3	H	-
2.080	2-OCH_3, 4-CF_3	2-CH_2CN	CH_3	H	-
2.081	2-OCH_3, 4-CH=$NOCH_3$	2-CH_2CN	CH_3	H	-

Comp. No.	R_1	R_2	R_3	R_4	Phys. data m.p. (°C)
2.082	2-OCH$_3$, 4-F	3-CH$_2$CN	CH$_3$	H	-
2.083	2-OCH$_3$, 4-Cl	3-CH$_2$CN	CH$_3$	H	-
2.084	2-OCH$_3$, 4-Br	3-CH$_2$CN	CH$_3$	H	-
2.085	2-OCH$_3$, 4-CF$_3$	3-CH$_2$CN	CH$_3$	H	-
2.086	2-OCH$_3$, 4-CH=NOCH$_3$	3-CH$_2$CN	CH$_3$	H	-
2.087	2-OCH$_3$	2-CH$_2$CN	H	H	-
2.088	2-OCH$_3$	3-CH$_2$CN	H	H	-
2.089	2-OCH$_3$	2-F	H	H	-
2.090	2-OCH$_3$	2-Cl	H	H	-
2.091	2-OCH$_3$	2-Br	H	H	-

Table 3: Compounds of formula I_3:



(I_3)

Comp. No.	R_1	R_2	R_3	R_4	Phys. data m.p. (°C)
3.001	2-OCH$_3$, 4-CN	4-CH$_3$	H	H	–
3.002	2-F, 4-Cl	4-CH$_3$	H	H	-
3.003	2-Cl, 4-Cl	4-CH$_3$	H	H	-
3.004	2-OCH$_3$, 4-F	4-CH$_3$	H	H	crystalline
3.005	2-OCH$_3$, 4-Cl	4-CH$_3$	H	H	-
3.006	2-OCH$_3$, 4-Br	4-CH$_3$	H	H	-
3.007	2-CF$_3$, 4-F	4-CH$_3$	H	H	-
3.008	2-OCH$_3$, 4-CF$_3$	4-CH$_3$	H	H	-
3.009	2-OCH$_3$, 4-CH$_3$	4-CH$_3$	H	H	-
3.010	2-OCH$_3$, 4-CH=NOCH$_3$	4-CH$_3$	H	H	
3.011	H	4-CH$_3$	H	H	MS: $[M+H]^+$
3.012	2-OCH$_3$, 4-CH$_2$CN	4-CH$_3$	H	H	MS: $[M+H]^+$
3.013	4-NO$_2$	3-OH, 6-CH$_3$	H	H	MS: $[M+H]^+$
3.014	2-OCH$_3$	3-OH, 6-CH$_3$	H	H	MS: $[M+H]^+$

Comp. No.	R_1	R_2	R_3	R_4	Phys. data m.p. (°C)
3.015	4-CH_2CN	3-OH, 6-CH_3	H	H	MS: $[M+H]^+$
3.016	2-OCH_3, 4-CH_2CN	3-OH, 6-CH_3	H	H	MS: $[M+H]^+$
3.017	4-CN	3-OH, 6-CH_3	H	H	MS: $[M+H]^+$
3.018	4-$CO_2C_2H_5$	3-OH, 6-CH_3	H	H	MS: $[M+H]^+$
3.019	2-Cl, 6-Cl	3-OH, 6-CH_3	H	H	MS: $[M+H]^+$
3.020	H	3-OH, 6-CH_3	H	H	MS: $[M+H]^+$
3.021	2-OCH_3, 4-F	6-CH_3	H	H	oil
3.022	2-OCH_3, 4-F	5-CH_3	H	H	oil
3.023	2-OCH_3, 4-CH=NOCH$_3$	5-CH_3	H	H	crystalline
3.024	2-OCH_3, 4-CH=NOCH$_3$	6-CH_3	H	H	crystalline
3.025	4-OC_6H_5	H	H	H	-
3.026	2-OCH_3, 4-CH_2CN	H	H	H	MS: $[M+H]^+$
3.027	4-CH_2CN	H	H	H	MS: $[M+H]^+$
3.028	H	H	H	H	MS: $[M+H]^+$
3.029	2-OCH_3, 4-CN	5-CF_3	H	H	94-95
3.030	2-F, 4-Cl	5-CF_3	H	H	-
3.031	2-OCH_3, 4-F	5-CF_3	H	H	crystalline
3.032	2-OCH_3, 4-Cl	5-CF_3	H	H	-
3.033	2-OCH_3, 4-Br	5-CF_3	H	H	-
3.034	2-OCH_3, 4-CF_3	5-CF_3	H	H	-
3.035	2-OCH_3, 4-CH_3	5-CF_3	H	H	-
3.036	2-OCH_3, 4-CH=NOCH$_3$	5-CF_3	H	H	crystalline
3.037	4-$CO_2C_2H_5$	5-CF_3	H	H	MS: $[M+H]^+$
3.038	2-OCH_3, 4-CN	4-CH_2CN	H	H	-
3.039	2-F, 4-Cl	4-CH_2CN	H	H	-
3.040	2-Cl, 4-Cl	4-CH_2CN	H	H	-
3.041	2-OCH_3, 4-F	4-CH_2CN	H	H	-
3.042	2-OCH_3, 4-Cl	4-CH_2CN	H	H	-
3.043	2-OCH_3, 4-Br	4-CH_2CN	H	H	-
3.044	2-CF_3, 4-F	4-CH_2CN	H	H	-
3.045	2-OCH_3, 4-CF_3	4-CH_2CN	H	H	-
3.046	2-OCH_3, 4-CH_3	4-CH_2CN	H	H	-
3.047	2-OCH_3, 4-CH=NOCH$_3$	4-CH_2CN	H	H	-
3.048	2-OCH_3	4-CH_2CN	H	H	-

Comp. No.	R_1	R_2	R_3	R_4	Phys. data m.p. (°C)
3.049	2-OCH_3	4-Cl	H	H	-
3.050	2-OCH_3	4-Br	H	H	-
3.051	2-OCH_3	6-CH_2CN	H	H	106
3.052	2-OCH_3	6-Cl	H	H	-
3.053	2-OCH_3	6-Br	H	H	-
3.054	2-OCH_3, 4-CN	5-Cl	H	H	-
3.055	2-F, 4-Cl	5-Cl	H	H	-
3.056	2-OCH_3, 4-F	5-Cl	H	H	-
3.057	2-OCH_3, 4-Cl	5-Cl	H	H	-
3.058	2-OCH_3, 4-Br	5-Cl	H	H	-
3.059	2-OCH_3, 4-CF_3	5-Cl	H	H	-
3.060	2-OCH_3, 4-CH_3	5-Cl	H	H	-
3.061	2-OCH_3, 4-CH=$NOCH_3$	5-Cl	H	H	-
3.062	4-$OCH_2CH_2N(C_2H_5)_2$	5-Cl	H	H	58-60
3.063	2-OCH_3, 4-CN	6-Br	H	H	84-85
3.064	2-F, 4-Cl	6-Br	H	H	-
3.065	2-Cl, 4-Cl	6-Br	H	H	-
3.066	2-OCH_3, 4-F	6-Br	H	H	crystalline
3.067	2-OCH_3, 4-Cl	6-Br	H	H	-
3.068	2-OCH_3, 4-Br	6-Br	H	H	-
3.069	2-CF_3, 4-F	6-Br	H	H	-
3.070	2-OCH_3, 4-CF_3	6-Br	H	H	-
3.071	2-OCH_3, 4-CH_3	6-Br	H	H	-
3.072	2-OCH_3, 4-CH=$NOCH_3$	6-Br	H	H	crystalline
3.073	2-OCH_3, 4-F	4-CH_3	CH_3	H	-
3.074	2-OCH_3, 4-Cl	4-CH_3	CH_3	H	-
3.075	2-OCH_3, 4-Br	4-CH_3	CH_3	H	-
3.076	2-OCH_3, 4-CF_3	4-CH_3	CH_3	H	-
3.077	2-OCH_3, 4-CH_3	4-CH_3	CH_3	H	-
3.078	2-OCH_3, 4-CH=$NOCH_3$	4-CH_3	CH_3	H	-
3.079	2-OCH_3, 4-F	4-CH_3	CH_3	CH_3	-
3.080	2-OCH_3, 4-Cl	4-CH_3	CH_3	CH_3	-
3.081	2-OCH_3, 4-Br	4-CH_3	CH_3	CH_3	-
3.082	2-OCH_3, 4-CF_3	4-CH_3	CH_3	CH_3	-

Comp. No.	R_1	R_2	R_3	R_4	Phys. data m.p. (°C)
3.083	2-OCH_3, 4-CH_3	4-CH_3	CH_3	CH_3	-
3.084	2-OCH_3, 4-CH=$NOCH_3$	4-CH_3	CH_3	CH_3	-
3.085	2-OCH_3, 4-F	3-OH	H	H	crystalline
3.086	2-OCH_3, 4-Cl	3-OH	H	H	-
3.087	2-OCH_3, 4-Br	3-OH	H	H	-
3.088	2-OCH_3, 4-CF_3	3-OH	H	H	-
3.089	2-OCH_3, 4-CH_3	3-OH	H	H	-
3.090	2-OCH_3, 4-CH=$NOCH_3$	3-OH	H	H	crystalline
3.091	4-CH_2CN	3-OC_2H_5	H	H	MS: $[M+H]^+$
3.092	2-OCH_3	3-OC_2H_5	H	H	MS: $[M+H]^+$
3.093	2-OCH_3, 4-CH_2CN	3-OC_2H_5	H	H	MS: $[M+H]^+$
3.094	2-OCH_3, 4-CN	3-OC_2H_5	H	H	MS: $[M+H]^+$
3.095	2-OCH_3, 4-F	6-CH_2CN	H	H	resin
3.096	2-OCH_3, 4-CH=$NOCH_3$	6-CH_2CN	H	H	solid
3.097	2-OCH_3, 4-CH=$NOCH_3$	5-CH_2CN	H	H	crystalline
3.098	2-OCH_3, 4-F	5-CH_2CN	H	H	resin
3.099	2-OCH_3, 4-CH=$NOCH_3$	6-OCH_3	H	H	resin
3.100	2-OCH_3, 4-F	6-OCH_3	H	H	resin
3.101	2-OCH_3, 4-CH=$NOCH_3$	H	H	H	resin
3.102	2-OCH_3, 4-F	H	H	H	oil

Biological Examples

Example B1: Herbicidal action prior to emergence of the plants (pre-emergence action)

Monocotyledonous and dicotyledonous test plants are sown in standard soil in pots. Immediately after sowing, the test compounds, in the form of an aqueous suspension (prepared from a wettable powder (Example F3, b) according to WO 97/34485) or in the form of an emulsion (prepared from an emulsifiable concentrate (Example F1, c) according to WO 97/34485), are applied by spraying in an optimum concentration (500 litres of water/ha). The test plants are then grown in a greenhouse under optimum conditions. After a test duration of 4 weeks, the test is evaluated in accordance with a scale of nine ratings (1 = total damage, 9 = no action). Ratings of from 1 to 4 (especially from 1 to 3) indicate good to very good herbicidal action.

Test plants: Panicum, Echinochloa (Ds), Amaranthus, Chenopodium, Stellaria, Veronica.

Table B1:

Concentration 1000 g of active ingredient/ha

Comp. No.	Panicum	Echinochloa (Ds)	Amaranthus	Chenopodium	Stellaria	Veronica
1.010	3	-	1	1	1	1
1.004	2	2	1	1	1	1
3.004	2	2	1	1	1	1

The same results are obtained when the compounds of formula I are formulated in accordance with the other Examples analogously to WO 97/34485.

Example B2: Post-emergence herbicidal action

Monocotyledonous and dicotyledonous test plants are sown in standard soil in pots. When the test plants are at the 2- to 3-leaf stage, the test compounds, in the form of an aqueous suspension (prepared from a wettable powder (Example F3, b) according to WO 97/34485) or in the form of an emulsion (prepared from an emulsifiable concentrate (Example F1, c) according to WO 97/34485), are applied by spraying in an optimum concentration (500 litres of water/ha). The test plants are then grown on in a greenhouse under optimum conditions. After a test duration of 2 to 3 weeks, the test is evaluated in accordance with a scale of nine ratings (1 = total damage, 9 = no action). Ratings of from 1 to 4 (especially from 1 to 3) indicate good to very good herbicidal action.

Test plants: Panicum, Euphorbia, Amaranthus, Chenopodium, Stellaria, Veronica.

Table B2:

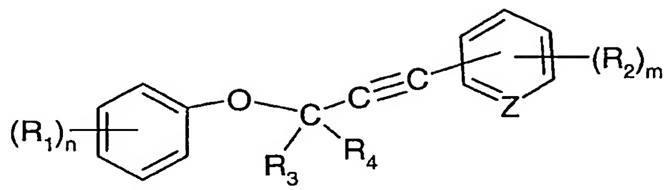
Concentration 1000 g of active ingredient/ha

Comp. No.	Pani-cum	Euphor-bia	Amaranthus	Chenopodium	Stellaria	Veronica
1.010	4	1	1	1	2	3
1.004	-	2	1	1	2	2
3.004	5	3	1	1	2	3

In the above Tables B1 and B2 " – " means that no data are available for that indication.
The same results are obtained when the compounds of formula I are formulated in accordance with the other Examples analogously to WO 97/34485.

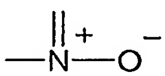
<u>What is claimed is</u>:

1. A compound of formula I



(I),

wherein

Z is =N- or  ;

n is 0, 1, 2, 3, 4 or 5;

each R_1 independently of any others is halogen, -CN, -SCN, $-SF_5$, $-NO_2$, $-NR_5R_6$, $-CO_2R_7$, $-CONR_8R_9$, $-C(R_{10})=NOR_{11}$, $-COR_{12}$, $-OR_{13}$, $-SR_{14}$, $-SOR_{15}$, $-SO_2R_{16}$, $-OSO_2R_{17}$, C_1-C_8alkyl, C_2-C_8alkenyl, C_2-C_8alkynyl or C_3-C_6cycloalkyl; or is C_1-C_8alkyl, C_2-C_8alkenyl or C_2-C_8alkynyl substituted by one or more halogen, -CN, $-NO_2$, $-NR_{18}R_{19}$, $-CO_2R_{20}$, $-CONR_{21}R_{22}$, $-COR_{23}$, $-C(R_{24})=NOR_{25}$, $-C(S)NR_{26}R_{27}$, $-C(C_1$-C_4alkylthio$)=NR_{28}$, $-OR_{29}$, $-SR_{30}$, $-SOR_{31}$, $-SO_2R_{32}$ or C_3-C_6cycloalkyl substituents; or

each R_1 independently of any others is C_3-C_6cycloalkyl substituted by one or more halogen, -CN, $-NO_2$, $-NR_{18}R_{19}$, $-CO_2R_{20}$, $-CONR_{21}R_{22}$, $-COR_{23}$, $-C(R_{24})=NOR_{25}$, $-C(S)NR_{26}R_{27}$, $-C(C_1$-C_4alkylthio$)=NR_{28}$, $-SR_{30}$, $-SOR_{31}$, $-SO_2R_{32}$ or C_3-C_6cycloalkyl substituents; or

each R_1 independently of any others is phenyl, which may in turn be substituted by one or more halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_4alkoxy, -CN, $-NO_2$, C_1-C_4alkylthio, C_1-C_4alkylsulfinyl or C_1-C_4alkylsulfonyl substituents; or

two adjacent R_1 together form a C_1-C_7alkylene bridge, which may be interrupted by 1 or 2 non-adjacent oxygen atoms and may be substituted by C_1-C_6alkyl or C_1-C_6alkoxy, the total number of ring atoms being at least 5 and at most 9; or

two adjacent R_1 together form a C_2-C_7alkenylene bridge, which may be interrupted by 1 or 2 non-adjacent oxygen atoms and may be substituted by C_1-C_6alkyl or C_1-C_6alkoxy, the total number of ring atoms being at least 5 and at most 9;

R_3 and R_4 are each independently of the other hydrogen, halogen, -CN, C_1-C_4alkyl or C_1-C_4-alkoxy; or

R_3 and R_4 together are C_2-C_5alkylene;

R_5 is hydrogen or C_1-C_8alkyl;

R_6 is hydrogen, C_1-C_8alkyl, C_3-C_8alkenyl, C_3-C_8alkynyl, phenyl or benzyl; wherein phenyl and benzyl may in turn be substituted by one or more halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_4alkoxy, -CN, -NO_2, C_1-C_4alkylthio, C_1-C_4alkylsulfinyl or C_1-C_4alkylsulfonyl substituents; or

R_5 and R_6 together are a C_2-C_5alkylene chain, which may be interrupted by an oxygen or a sulfur atom;

R_7 is hydrogen, C_1-C_8alkyl, C_3-C_8alkenyl or C_3-C_8alkynyl, or is C_1-C_8alkyl, C_3-C_8alkenyl or C_3-C_8alkynyl substituted by one or more halogen, C_1-C_4alkoxy or phenyl substituents, wherein phenyl may in turn be substituted by one or more halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_4alkoxy, -CN, -NO_2, C_1-C_4alkylthio, C_1-C_4alkylsulfinyl or C_1-C_4alkylsulfonyl substituents;

R_8 is hydrogen or C_1-C_8alkyl;

R_9 is hydrogen or C_1-C_8alkyl, or is C_1-C_8alkyl substituted by one or more -COOH, C_1-C_8alkoxycarbonyl or –CN substituents, or

R_9 is C_3-C_8alkenyl, C_3-C_8alkynyl, phenyl or benzyl, wherein phenyl and benzyl may in turn be substituted by one or more halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_4alkoxy, -CN, -NO_2, C_1-C_4alkylthio, C_1-C_4alkylsulfinyl or C_1-C_4alkylsulfonyl substituents; or

R_8 and R_9 together are C_2-C_5alkylene;

R_{10} is hydrogen, C_1-C_4alkyl, C_1-C_4haloalkyl or C_3-C_6cycloalkyl;

R_{11} is hydrogen, C_1-C_8alkyl, C_3-C_8alkenyl, C_3-C_8alkynyl, C_1-C_4haloalkyl or C_3-C_6haloalkenyl;

R_{12} is hydrogen, C_1-C_4alkyl, C_1-C_4haloalkyl or C_3-C_6cycloalkyl;

R_{13} is hydrogen, C_1-C_8alkyl, C_3-C_8alkenyl or C_3-C_8alkynyl; or

R_{13} is phenyl or phenyl-C_1-C_6alkyl, wherein both phenyl rings may in turn be substituted by one or more halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_4alkoxy, -CN, -NO_2, C_1-C_8alkylthio, C_1-C_8alkylsulfinyl or C_1-C_8alkylsulfonyl substituents, or

R_{13} is C_1-C_8alkyl substituted by one or more halogen, –CN, C_1-C_6alkylamino, di(C_1-C_6alkyl)-amino or C_1-C_4alkoxy substituents;

R_{14} is hydrogen, C_1-C_8alkyl, C_3-C_8alkenyl or C_3-C_8alkynyl, or is C_1-C_8alkyl substituted by one or more halogen, –CN or C_1-C_4alkoxy substituents;

R_{15}, R_{16} and R_{17} are each independently of the others C_1-C_8alkyl, C_3-C_8alkenyl or C_3-C_8-alkynyl, or C_1-C_8alkyl substituted by one or more halogen, –CN or C_1-C_4alkoxy substituents;

R_{18} is hydrogen or C_1-C_8alkyl;

R_{19} is hydrogen, C_1-C_8alkyl, C_3-C_8alkenyl, C_3-C_8alkynyl, phenyl or benzyl, wherein phenyl and benzyl may in turn be substituted by one or more halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_4-alkoxy, -CN, -NO_2, C_1-C_4alkylthio, C_1-C_4alkylsulfinyl or C_1-C_4alkylsulfonyl substituents; or

R_{18} and R_{19} together are a C_2-C_5alkylene chain, which may be interrupted by an oxygen or a sulfur atom;
R_{20} is hydrogen, C_1-C_8alkyl, C_3-C_8alkenyl, C_3-C_8alkynyl, phenyl or benzyl, wherein phenyl and benzyl may in turn be substituted by one or more halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_4-alkoxy, -CN, $-NO_2$, C_1-C_4alkylthio, C_1-C_4alkylsulfinyl or C_1-C_4alkylsulfonyl substituents;
R_{21} is hydrogen or C_1-C_8alkyl;
R_{22} is hydrogen or C_1-C_8alkyl, or is C_1-C_8alkyl substituted by one or more -COOH, C_1-C_8-alkoxycarbonyl or –CN substituents, or
R_{22} is C_3-C_8alkenyl, C_3-C_8alkynyl, phenyl or benzyl, wherein phenyl and benzyl may in turn be substituted by one or more halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_4alkoxy, -CN, $-NO_2$, C_1-C_4alkylthio, C_1-C_4alkylsulfinyl or C_1-C_4alkylsulfonyl substituents; or
R_{21} and R_{22} together are C_2-C_5alkylene;
R_{23} is hydrogen, C_1-C_4alkyl, C_1-C_4haloalkyl or C_3-C_6cycloalkyl;
R_{24} is hydrogen, C_1-C_4alkyl, C_1-C_4haloalkyl or C_3-C_6cycloalkyl;
R_{25} is hydrogen, C_1-C_8alkyl, C_3-C_8alkenyl, C_3-C_8alkynyl, C_1-C_4haloalkyl or C_3-C_6haloalkenyl;
R_{26} is hydrogen or C_1-C_8alkyl;
R_{27} is hydrogen or C_1-C_8alkyl, or is C_1-C_8alkyl substituted by one or more -COOH, C_1-C_8-alkoxycarbonyl or –CN substituents, or
R_{27} is C_3-C_8alkenyl, C_3-C_8alkynyl, phenyl or benzyl, wherein phenyl and benzyl may in turn be substituted by one or more halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_4alkoxy, -CN, $-NO_2$, C_1-C_4alkylthio, C_1-C_4alkylsulfinyl or C_1-C_4alkylsulfonyl substituents; or
R_{26} and R_{27} together are C_2-C_5alkylene;
R_{28} is hydrogen or C_1-C_8alkyl;
R_{29} and R_{30} are each independently of the other hydrogen, C_1-C_8alkyl, C_3-C_8alkenyl or C_3-C_8-alkynyl, or C_1-C_8alkyl substituted by one or more halogen, –CN or C_1-C_4alkoxy substituents;
R_{31} and R_{32} are each independently of the other C_1-C_8alkyl, C_3-C_8alkenyl or C_3-C_8alkynyl, or C_1-C_8alkyl substituted by one or more halogen, –CN or C_1-C_4alkoxy substituents;
m is 0, 1, 2, 3 or 4;
each R_2 independently of any others is halogen, -CN, -SCN, -OCN, $-N_3$, $-SF_5$, $-NO_2$, $-NR_{33}R_{34}$, $-CO_2R_{35}$, $-CONR_{36}R_{37}$, $-C(R_{38})=NOR_{39}$, $-COR_{40}$, $-OR_{41}$, $-SR_{42}$, $-SOR_{43}$, $-SO_2R_{44}$, $-OSO_2R_{45}$, $-N([CO]_pR_{46})COR_{47}$, $-N(OR_{54})COR_{55}$, $-N(R_{56})SO_2R_{57}$, $-N(SO_2R_{58})SO_2R_{59}$, $-N=C(OR_{60})R_{61}$, $-CR_{62}(OR_{63})OR_{64}$, $-OC(O)NR_{65}R_{66}$, $-SC(O)NR_{67}R_{68}$, $-OC(S)NR_{69}R_{70}$ or -N-phthalimide; or
R_2 is a 5- to 7-membered heterocyclic ring system which may be aromatic or partially or fully saturated and may contain from 1 to 4 hetero atoms selected from nitrogen, oxygen and sulfur, it being possible for that heterocyclic ring system in turn to be substituted by one or

more halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, hydroxy-C_1-C_4alkyl, C_1-C_4alkoxy, C_1-C_4alkoxy-C_1-C_4alkyl, -CN, -NO_2, C_1-C_6alkylthio, C_1-C_6alkylsulfinyl or C_1-C_6alkylsulfonyl substituents;
R_{33} is hydrogen or C_1-C_8alkyl; and
R_{34} is hydrogen, C_1-C_8alkyl, C_3-C_8alkenyl, C_3-C_8alkynyl, phenyl or benzyl, wherein phenyl and benzyl may in turn be substituted by one or more halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_4-alkoxy, -CN, -NO_2, C_1-C_4alkylthio, C_1-C_4alkylsulfinyl or C_1-C_4alkylsulfonyl substituents; or
R_{33} and R_{34} together are a C_2-C_5alkylene chain, which may be interrupted by an oxygen or a sulfur atom;
R_{35} is hydrogen, C_1-C_8alkyl, C_3-C_8alkenyl or C_3-C_8alkynyl, or is C_1-C_8alkyl, C_3-C_8alkenyl or C_3-C_8alkynyl substituted by one or more halogen, C_1-C_4alkoxy or phenyl substituents, wherein phenyl may in turn be substituted by one or more halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_4alkoxy, -CN, -NO_2, C_1-C_4alkylthio, C_1-C_4alkylsulfinyl or C_1-C_4alkylsulfonyl substituents;
R_{36} is hydrogen or C_1-C_8alkyl;
R_{37} is hydrogen or C_1-C_8alkyl, or is C_1-C_8alkyl substituted by one or more -COOH, C_1-C_8-alkoxycarbonyl or –CN substituents, or
R_{37} is C_3-C_8alkenyl, C_3-C_8alkynyl, phenyl or benzyl, wherein phenyl and benzyl may in turn be substituted by one or more halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_4alkoxy, -CN, -NO_2, C_1-C_4alkylthio, C_1-C_4alkylsulfinyl or C_1-C_4alkylsulfonyl substituents; or
R_{36} and R_{37} together are C_3-C_5alkylene;
R_{38} is hydrogen, C_1-C_4alkyl, C_1-C_4haloalkyl or C_3-C_6cycloalkyl;
R_{39} is hydrogen, C_1-C_8alkyl, C_3-C_8alkenyl, C_3-C_8alkynyl, C_1-C_4haloalkyl or C_3-C_6haloalkenyl;
R_{40} is hydrogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_8alkylthio, -C(O)-C(O)OC_1-C_4alkyl or C_3-C_6-cycloalkyl;
R_{41} is hydrogen, C_1-C_8alkyl, C_3-C_8alkenyl, C_3-C_8alkynyl, C_1-C_6alkoxy-C_1-C_6alkyl, C_1-C_8alkyl-carbonyl, C_1-C_8alkoxycarbonyl, C_3-C_8alkenyloxycarbonyl, C_1-C_6alkoxy-C_1-C_6alkoxycarbonyl, C_1-C_6alkylthio-C_1-C_6alkyl, C_1-C_6alkylsulfinyl-C_1-C_6alkyl or C_1-C_6alkylsulfonyl-C_1-C_6alkyl; or
R_{41} is phenyl or phenyl-C_1-C_6alkyl, wherein both phenyl rings may in turn be substituted by one or more halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_4alkoxy, -CN, -NO_2, or -$S(O)_2C_1$-C_8alkyl substituents, or
R_{41} is C_1-C_8alkyl substituted by one or more –COOH, C_1-C_8alkoxycarbonyl, C_1-C_6alkylamino, di(C_1-C_6alkyl)amino or –CN substituents;
R_{42} is hydrogen, C_1-C_8alkyl, C_3-C_8alkenyl or C_3-C_8alkynyl, or is C_1-C_8alkyl substituted by one or more halogen, –CN or C_1-C_4alkoxy substituents;
R_{43} and R_{44} are each independently of the other C_1-C_8alkyl, C_3-C_8alkenyl or C_3-C_8alkynyl, or C_1-C_8alkyl substituted by one or more halogen, –CN or C_1-C_4alkoxy substituents;

R_{45} is C_1-C_8alkyl, C_1-C_8alkyl substituted by one or more halogen, -CN or C_1-C_4alkoxy substituents, C_3-C_8alkenyl or C_3-C_8alkynyl, or
R_{45} is phenyl, it being possible for the phenyl ring to be substituted by one or more halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_4alkoxy, -CN, -NO_2, C_1-C_8alkylthio, C_1-C_8alkylsulfinyl or C_1-C_8alkylsulfonyl substituents;
R_{46} is hydrogen, C_1-C_8alkyl, C_3-C_8alkenyl, C_3-C_8alkynyl or C_1-C_4haloalkyl;
R_{47} is hydrogen, C_1-C_8alkyl, C_1-C_4alkoxy, C_3-C_8alkenyl or C_3-C_8alkynyl, or is C_1-C_8alkyl substituted by one or more halogen, -CN, C_1-C_4alkoxy, C_1-C_8alkoxycarbonyl, -NH_2, C_1-C_4-alkylamino, di(C_1-C_4-alkyl)amino, -$NR_{48}COR_{49}$, -$NR_{50}SO_2R_{51}$ or -$NR_{52}CO_2R_{53}$ substituents, or
R_{47} is phenyl or benzyl, each of which may in turn be substituted by one or more halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_4alkoxy, -CN, -NO_2, C_1-C_4alkylthio, C_1-C_4alkylsulfinyl or C_1-C_4alkylsulfonyl substituents;
p is 0 or 1;
R_{48}, R_{49}, R_{50}, R_{51}, R_{52} and R_{53} are each independently of the others hydrogen, C_1-C_8alkyl, phenyl, benzyl or naphthyl, it being possible for the three last-mentioned aromatic radicals in turn to be substituted by one or more halogen, C_1-C_8alkyl, C_1-C_4haloalkyl, C_1-C_4alkoxy, C_1-C_4alkylamino, di(C_1-C_4alkyl)amino, -NH_2, -CN, -NO_2, C_1-C_4alkylthio, C_1-C_4alkylsulfinyl or C_1-C_4alkylsulfonyl substituents;
R_{54} and R_{55} are each independently of the other hydrogen, C_1-C_8alkyl or phenyl, whereby the phenyl ring may in turn be substituted by one or more halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_4alkoxy, -CN, -NO_2, C_1-C_8alkylthio, C_1-C_8alkylsulfinyl or C_1-C_8alkylsulfonyl substituents;
R_{56} is hydrogen, C_1-C_8alkyl, C_1-C_4haloalkyl, C_1-C_4alkoxy, C_3-C_8alkenyl, C_3-C_8alkynyl or benzyl, it being possible for benzyl in turn to be substituted by one or more halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_4alkoxy, -CN, -NO_2, C_1-C_8alkylthio, C_1-C_8alkylsulfinyl or C_1-C_8alkylsulfonyl substituents;
R_{57} is C_1-C_8alkyl, C_1-C_4haloalkyl, phenyl, benzyl or naphthyl, it being possible for the three last-mentioned aromatic rings to be substituted by one or more halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_4alkoxy, C_1-C_4alkylamino, di(C_1-C_4alkyl)amino, -NH_2, -CN, -NO_2, C_1-C_4alkylthio, C_1-C_4alkylsulfinyl or C_1-C_4alkylsulfonyl substituents;
R_{58} and R_{59} are each independently of the other C_1-C_8alkyl, C_3-C_8alkenyl, C_3-C_8alkynyl, phenyl, benzyl or naphthyl, it being possible for the three last-mentioned aromatic rings to be substituted by one or more halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_4alkoxy, C_1-C_4alkyl-amino, di(C_1-C_4alkyl)amino, -NH_2, -CN, -NO_2, C_1-C_4alkylthio, C_1-C_4alkylsulfinyl or C_1-C_4alkyl-sulfonyl substituents;
R_{60} and R_{61} are each independently of the other hydrogen or C_1-C_6alkyl;
R_{62}, R_{63} and R_{64} are each independently of the others hydrogen or C_1-C_8alkyl, or

R_{63} and R_{64} together form a C_2-C_5alkylene bridge;

R_{65}, R_{66}, R_{67}, R_{68}, R_{69} and R_{70} are each independently of the others hydrogen or C_1-C_8alkyl, or

R_{65} and R_{66} together or R_{67} and R_{68} together or R_{69} and R_{70} together form a C_2-C_5alkylene bridge; or

each R_2 independently of any others is C_1-C_8alkyl, or is C_1-C_8alkyl mono- or poly-substituted by halogen, -CN, $-N_3$, -SCN, $-NO_2$, $-NR_{71}R_{72}$, $-CO_2R_{73}$, $-CONR_{74}R_{75}$, $-COR_{76}$, $-C(R_{77})$=NOR_{78}, $-C(S)NR_{79}R_{80}$, -C(C_1-C_4alkylthio)=NR_{81}, $-OR_{82}$, $-SR_{83}$, $-SOR_{84}$, $-SO_2R_{85}$, $-O(SO_2)R_{86}$, $-N(R_{87})CO_2R_{88}$, $-N(R_{89})COR_{90}$, $-S^+(R_{91})_2$, $-N^+(R_{92})_3$, $-Si(R_{93})_3$ or C_3-C_6cycloalkyl; or

each R_2 independently of any others is C_1-C_8alkyl substituted by a 5- to 7-membered heterocyclic ring system, which may be aromatic or partially or fully saturated and may contain from 1 to 4 hetero atoms selected from nitrogen, oxygen and sulfur, it being possible for that heterocyclic ring system in turn to be substituted by one or more halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, hydroxy-C_1-C_4alkyl, C_1-C_4alkoxy, C_1-C_4alkoxy-C_1-C_4alkyl, -CN, $-NO_2$, C_1-C_6alkylthio, C_1-C_6alkylsulfinyl or C_1-C_6alkylsulfonyl substituents; or

each R_2 independently of any others is C_2-C_8alkenyl, or is C_2-C_8alkenyl mono- or poly-substituted by halogen, -CN, $-NO_2$, $-CO_2R_{94}$, $-CONR_{95}R_{96}$, $-COR_{97}$, $-C(R_{98})$=NOR_{99}, $-C(S)NR_{100}R_{101}$, -C(C_1-C_4alkylthio)=NR_{102}, $-OR_{103}$, $-Si(R_{104})_3$ or C_3-C_6cycloalkyl; or

each R_2 independently of any others is C_2-C_8alkynyl, or is C_2-C_8alkynyl mono- or poly-substituted by halogen, -CN, $-CO_2R_{105}$, $-CONR_{106}R_{107}$, $-COR_{108}$, $-C(R_{109})$=NOR_{110}, $-C(S)NR_{111}R_{112}$, -C(C_1-C_4alkylthio)=NR_{113}, $-OR_{114}$, $-Si(R_{115})_3$ or C_3-C_6cycloalkyl; or

each R_2 independently of any others is C_3-C_6cycloalkyl, or is C_3-C_6cycloalkyl mono- or poly-substituted by halogen, -CN, $-CO_2R_{116}$, $-CONR_{117}R_{118}$, $-COR_{119}$, $-C(R_{120})$=NOR_{121}, $-C(S)NR_{122}R_{123}$ or -C(C_1-C_4alkylthio)=NR_{124}; or

two adjacent R_2 together form a C_1-C_7alkylene bridge, which may be interrupted by 1 or 2 non-adjacent oxygen atoms and may be substituted by C_1-C_6alkyl or C_1-C_6alkoxy, the total number of ring atoms being at least 5 and at most 9; or

two adjacent R_2 together form a C_2-C_7alkenylene bridge, which may be interrupted by 1 or 2 non-adjacent oxygen atoms and may be substituted by C_1-C_6alkyl or C_1-C_6alkoxy, the total number of ring atoms being at least 5 and at most 9;

R_{71} is hydrogen or C_1-C_8alkyl;

R_{72} is hydrogen, C_1-C_8alkyl, C_3-C_8alkenyl, C_3-C_8alkynyl, phenyl or benzyl, wherein phenyl and benzyl may in turn be substituted by one or more halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_4alkoxy, -CN, $-NO_2$, C_1-C_4alkylthio, C_1-C_4alkylsulfinyl or C_1-C_4alkylsulfonyl substituents; or

R_{71} and R_{72} together are a C_2-C_5alkylene chain, which may be interrupted by an oxygen or a sulfur atom;
R_{73} is hydrogen, C_1-C_8alkyl, C_3-C_8alkenyl or C_3-C_8alkynyl, or is C_1-C_8alkyl, C_3-C_8alkenyl or C_3-C_8alkynyl substituted by one or more halogen, C_1-C_4alkoxy or phenyl substituents, it being possible for phenyl in turn to be substituted by one or more halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_4alkoxy, -CN, -NO_2, C_1-C_4alkylthio, C_1-C_4alkylsulfinyl or C_1-C_4alkyl-sulfonyl substituents;
R_{74} is hydrogen or C_1-C_8alkyl;
R_{75} is hydrogen, C_1-C_8alkyl or C_3-C_7cycloalkyl, or is C_1-C_8alkyl substituted by one or more -COOH, C_1-C_8alkoxycarbonyl, C_1-C_6alkoxy or –CN substituents; or
R_{75} is C_3-C_8alkenyl, C_3-C_8alkynyl, phenyl or benzyl, wherein phenyl and benzyl may in turn be substituted by one or more halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_4alkoxy, -CN, -NO_2, C_1-C_4alkylthio, C_1-C_4alkylsulfinyl or C_1-C_4alkylsulfonyl substituents; or
R_{74} and R_{75} together are a C_2-C_5alkylene chain, which may be interrupted by an oxygen or sulfur atom;
R_{76} is hydrogen, C_1-C_4alkyl, C_1-C_4haloalkyl or C_3-C_6cycloalkyl;
R_{77} is hydrogen, C_1-C_4alkyl, C_1-C_4haloalkyl or C_3-C_6cycloalkyl;
R_{78} is hydrogen, C_1-C_8alkyl, C_3-C_8alkenyl, C_3-C_8alkynyl, C_1-C_4haloalkyl or C_3-C_6haloalkenyl; and
R_{79} is hydrogen or C_1-C_8alkyl;
R_{80} is hydrogen or C_1-C_8alkyl, or is C_1-C_8alkyl substituted by one or more -COOH, C_1-C_8-alkoxycarbonyl or –CN substituents; or
R_{80} is C_3-C_8alkenyl, C_3-C_8alkynyl, phenyl or benzyl, wherein phenyl and benzyl may in turn be substituted by one or more halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_4alkoxy, -CN, -NO_2, C_1-C_4alkylthio, C_1-C_4alkylsulfinyl or C_1-C_4alkylsulfonyl substituents; or
R_{79} and R_{80} together are C_2-C_5alkylene;
R_{81} is hydrogen or C_1-C_8alkyl;
R_{82} is -Si(C_1-C_6alkyl)$_3$, C_3-C_8alkenyl, C_3-C_8alkynyl or C_1-C_8alkyl, whereby C_1-C_8alkyl is mono- or poly-substituted by halogen, -CN, -NH_2, C_1-C_6alkylamino, di(C_1-C_6alkyl)amino or C_1-C_4alkoxy;
R_{83} is hydrogen, C_1-C_8alkyl, C_3-C_8alkenyl, C_3-C_8alkynyl or C_1-C_8alkyl, whereby C_1-C_8alkyl is mono- or poly-substituted by halogen, -CN, -NH_2, C_1-C_6alkylamino, di(C_1-C_6alkyl)amino or C_1-C_4alkoxy;
R_{84}, R_{85} and R_{86} are each independently of the others C_1-C_8alkyl, C_3-C_8alkenyl or C_3-C_8-alkynyl, or C_1-C_8alkyl which is substituted by one or more halogen, –CN or C_1-C_4alkoxy substituents;

R_{87} and R_{89} are each independently of the other hydrogen, C_1-C_8alkyl or C_1-C_8alkoxy;
R_{88} is C_1-C_8alkyl;
R_{90} is hydrogen or C_1-C_8alkyl;
R_{91} is C_1-C_4alkyl;
R_{92} and R_{93} are each independently of the other C_1-C_6alkyl;
R_{94} is hydrogen, C_1-C_8alkyl, C_3-C_8alkenyl or C_3-C_8alkynyl, each of which may be mono- or poly-substituted by one or more halogen, C_1-C_4alkoxy or phenyl substituents, wherein phenyl may in turn be substituted by one or more halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_4alkoxy, -CN, -NO_2, C_1-C_4alkylthio, C_1-C_4alkylsulfinyl or C_1-C_4alkylsulfonyl substituents;
R_{95} is hydrogen or C_1-C_8alkyl;
R_{96} is hydrogen or C_1-C_8alkyl, or is C_1-C_8alkyl substituted by one or more -COOH, C_1-C_8-alkoxycarbonyl or –CN substituents; or
R_{96} is C_3-C_8alkenyl, C_3-C_8alkynyl, phenyl or benzyl, wherein phenyl and benzyl may in turn be substituted by one or more halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_4alkoxy, -CN, -NO_2, C_1-C_4alkylthio, C_1-C_4alkylsulfinyl or C_1-C_4alkylsulfonyl substituents; or
R_{95} and R_{96} together are C_2-C_5alkylene;
R_{97} and R_{98} are each independently of the other hydrogen, C_1-C_4alkyl, C_1-C_4haloalkyl or C_3-C_6cycloalkyl;
R_{99} is hydrogen, C_1-C_8alkyl, C_3-C_8alkenyl, C_3-C_8alkynyl, C_1-C_4haloalkyl or C_3-C_6haloalkenyl;
R_{100} is hydrogen or C_1-C_8alkyl;
R_{101} is hydrogen or C_1-C_8alkyl, or is C_1-C_8alkyl substituted by one or more -COOH, C_1-C_8-alkoxycarbonyl or –CN substituents; or
R_{101} is C_3-C_8alkenyl, C_3-C_8alkynyl, phenyl or benzyl, wherein phenyl and benzyl may in turn be substituted by one or more halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_4alkoxy, -CN, -NO_2, C_1-C_4alkylthio, C_1-C_4alkylsulfinyl or C_1-C_4alkylsulfonyl substituents; or
R_{100} and R_{101} together are C_2-C_5alkylene;
R_{102} is hydrogen or C_1-C_8alkyl;
R_{103} is hydrogen, C_1-C_8alkyl, -Si(C_1-C_6alkyl)$_3$, C_3-C_8alkenyl or C_3-C_8alkynyl;
R_{104} is C_1-C_6alkyl;
R_{105} is hydrogen, C_1-C_8alkyl, C_3-C_8alkenyl or C_3-C_8alkynyl, each of which may be mono- or poly-substituted by one or more halogen, C_1-C_4alkoxy or phenyl substituents, wherein phenyl may in turn be substituted by one or more halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_4alkoxy, -CN, -NO_2, C_1-C_4alkylthio, C_1-C_4alkylsulfinyl or C_1-C_4alkylsulfonyl substituents;
R_{106} is hydrogen or C_1-C_8alkyl;
R_{107} is hydrogen or C_1-C_8alkyl, or is C_1-C_8alkyl substituted by one or more -COOH, C_1-C_8alkoxycarbonyl or –CN substituents; or

R_{107} is C_3-C_8alkenyl, C_3-C_8alkynyl, phenyl or benzyl, wherein phenyl and benzyl may in turn be substituted by one or more halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_4alkoxy, -CN, -NO_2, C_1-C_4alkylthio, C_1-C_4alkylsulfinyl or C_1-C_4alkylsulfonyl substituents; or

R_{106} and R_{107} together are C_2-C_5alkylene;

R_{108} is hydrogen, C_1-C_4alkyl, C_1-C_4haloalkyl or C_3-C_6cycloalkyl;

R_{109} is hydrogen, C_1-C_4alkyl, C_1-C_4haloalkyl or C_3-C_6cycloalkyl;

R_{110} is hydrogen, C_1-C_8alkyl, C_3-C_8alkenyl, C_3-C_8alkynyl, C_1-C_4haloalkyl or C_3-C_6haloalkenyl;

R_{111} is hydrogen or C_1-C_8alkyl;

R_{112} is hydrogen or C_1-C_8alkyl, or is C_1-C_8alkyl substituted by one or more -COOH, C_1-C_8-alkoxycarbonyl or –CN substituents; or

R_{112} is C_3-C_8alkenyl, C_3-C_8alkynyl, phenyl or benzyl, wherein phenyl and benzyl may in turn be substituted by one or more halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_4alkoxy, -CN, -NO_2, C_1-C_4alkylthio, C_1-C_4alkylsulfinyl or C_1-C_4alkylsulfonyl substituents; or

R_{111} and R_{112} together are C_2-C_5alkylene;

R_{113} is hydrogen or C_1-C_8alkyl;

R_{114} is hydrogen, C_1-C_8alkyl, -Si(C_1-C_6alkyl)$_3$, C_3-C_8alkenyl or C_3-C_8alkynyl;

R_{115} is C_1-C_6alkyl;

R_{116} is hydrogen, C_1-C_8alkyl, C_3-C_8alkenyl or C_3-C_8alkynyl, each of which may be mono- or poly-substituted by one or more halogen, C_1-C_4alkoxy or phenyl substituents, wherein phenyl may in turn be substituted by one or more halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_4alkoxy, -CN, -NO_2, C_1-C_4alkylthio, C_1-C_4alkylsulfinyl or C_1-C_4alkylsulfonyl substituents;

R_{117} is hydrogen or C_1-C_8alkyl;

R_{118} is hydrogen or C_1-C_8alkyl, or is C_1-C_8alkyl substituted by one or more -COOH, C_1-C_8alkoxycarbonyl or –CN substituents; or

R_{118} is C_3-C_8alkenyl, C_3-C_8alkynyl, phenyl or benzyl, wherein phenyl and benzyl may in turn be substituted by one or more halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_4alkoxy, -CN, -NO_2, C_1-C_4alkylthio, C_1-C_4alkylsulfinyl or C_1-C_4alkylsulfonyl substituents; or

R_{117} and R_{118} together are C_2-C_5alkylene;

R_{119} is hydrogen, C_1-C_4alkyl, C_1-C_4haloalkyl or C_3-C_6cycloalkyl;

R_{120} is hydrogen, C_1-C_4alkyl, C_1-C_4haloalkyl or C_3-C_6cycloalkyl;

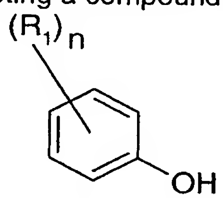
R_{121} is hydrogen, C_1-C_8alkyl, C_3-C_8alkenyl, C_3-C_8alkynyl, C_1-C_4haloalkyl or C_3-C_6haloalkenyl;

R_{122} is hydrogen or C_1-C_8alkyl;

R_{123} is hydrogen or C_1-C_8alkyl, or is C_1-C_8alkyl substituted by one or more -COOH, C_1-C_8-alkoxycarbonyl or –CN substituents; or

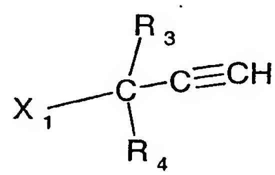
R_{123} is C_3-C_8alkenyl, C_3-C_8alkynyl, phenyl or benzyl, wherein phenyl and benzyl may in turn be substituted by one or more halogen, C_1-C_4alkyl, C_1-C_4haloalkyl, C_1-C_4alkoxy, -CN, -NO_2, C_1-C_4alkylthio, C_1-C_4alkylsulfinyl or C_1-C_4alkylsulfonyl substituents; or
R_{122} and R_{123} together are C_2-C_5alkylene; and
R_{124} is hydrogen or C_1-C_8alkyl,
or an agrochemically acceptable salt or any stereoisomer or tautomer of a compound of formula I.

2. A process for the preparation of a compound of formula I according to claim 1, which process comprises reacting a compound of formula II



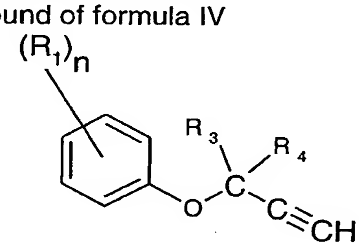
(II),

wherein R_1 and n are as defined in claim 1, in the presence of a base, with a compound of formula III



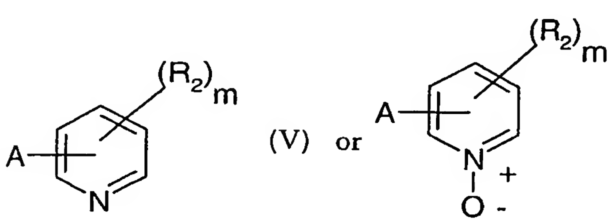
(III),

wherein R_3 and R_4 are as defined in claim 1 and X_1 is O-tosyl, O-mesyl, chlorine, bromine or iodine, to form a compound of formula IV



(IV),

wherein R_1, R_3, R_4 and n are as defined, and then coupling that compound with a compound of formula V or Va



(V) or (Va),

wherein R_2 and m are as defined in claim 1 and A is a leaving group, in the presence of a palladium catalyst, and, if desired, oxidising the resulting pyridine derivative of formula I wherein Z is =N- to form the corresponding pyridine N-oxide of formula I wherein Z is

$$-\overset{\| +}{N}-O^{-}.$$

3. A herbicidal and plant-growth-inhibiting composition, comprising a herbicidally effective amount of a compound of formula I on an inert carrier.

4. A method of controlling undesired plant growth, which method comprises applying a compound of formula I, or a composition comprising such a compound, in a herbicidally effective amount to plants or to the locus thereof.

5. A method of inhibiting plant growth, which method comprises applying a compound of formula I, or a composition comprising such a compound, in a herbicidally effective amount to plants or to the locus thereof.

6. A compound according to claim 1, wherein Z is =N-; and each R_2 independently of any others is C_2-C_8alkenyl, or is C_2-C_8alkenyl mono- or poly-substituted by -CN, -NO_2, -CO_2R_{94}, -$CONR_{95}R_{96}$, -COR_{97}, -$C(R_{98})$=NOR_{99}, -$C(S)NR_{100}R_{101}$, -C(C_1-C_4alkylthio)=NR_{102}, -OR_{103}, -$Si(R_{104})_3$ or C_3-C_6cycloalkyl.

7. A compound according to claim 1, wherein each R_2 independently of any others is halogen, -CN, -SCN, -OCN, -N_3, -$CONR_{36}R_{37}$, -$C(R_{38})$=NOR_{39}, -COR_{40}, -OR_{41}, -SO_2R_{45}, -$N([CO]_pR_{46})COR_{47}$, -$N(R_{56})SO_2R_{57}$, -$N(SO_2R_{58})SO_2R_{59}$, -N=$C(OR_{60})R_{61}$ or C_1-C_8alkyl, or is C_1-C_8alkyl mono- or poly-substituted by halogen, -CN, -N_3, -SCN, -$CONR_{74}R_{75}$, -COR_{76}, -$C(R_{77})$=NOR_{78}, -$C(S)NR_{79}R_{80}$, -OR_{82}, -SOR_{84}, -SO_2R_{85} or -$N(R_{89})COR_{90}$.

8. A compound according to claim 1, wherein each R_1 independently of any others is halogen, -CN, C_1-C_3alkyl, C_1-C_3haloalkyl, C_1-C_3cyanoalkyl, -OR_{13} or -$C(R_{24})$=NOR_{25}; R_{13} is C_1-C_3alkyl or di(C_1-C_4-alkyl)amino-C_1-C_4alkyl; R_{24} is hydrogen or methyl; and R_{25} is hydrogen or C_1-C_3alkyl.

9. A compound according to claim 1, wherein R_3 and R_4 are each independently of the other hydrogen or methyl.

INTERNATIONAL SEARCH REPORT

International Application No
PCT/EP 02/08878

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 A01N43/40 C07D213/61 C07D213/64 C07D213/16 C07D213/73
C07D213/57 C07D213/75 C07D213/65 C07D213/74

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 C07D A01N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ, BEILSTEIN Data, CHEM ABS Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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"A" document defining the general state of the art which is not considered to be of particular relevance

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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
31 October 2002	08/11/2002

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Johnson, C

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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Form PCT/ISA/210 (patent family annex) (July 1992)

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